Manual


SEARCH AND RESCUE HELICOPTER FLIGHT SIM
Search & Rescue 3
Featuring Real:
Rescue scenarios,
Coast Guard Procedures,
Helicopter flight modeling
GLOBAL STAR SOFTWARE
Win 98/Me
PC CD ROM
EVERYONE
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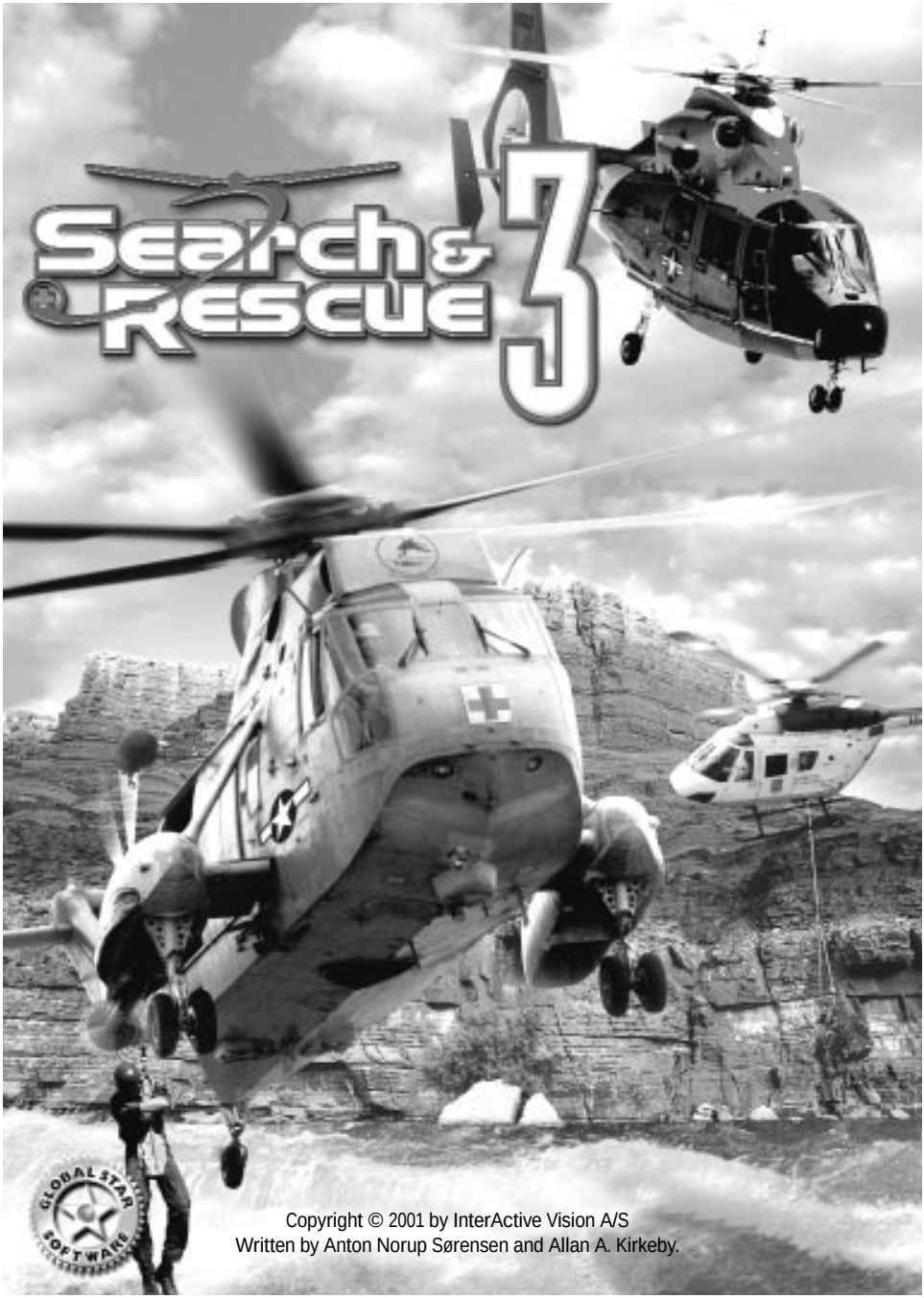
CONTENT RATED BY ESRB



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Introduction

▶ Thank you for purchasing Search And Rescue 3!

You are now the proud owner of the most realistic search and rescue helicopter simulation on the market.

Search And Rescue 3 (SAR3) is the sequel to InterActive Vision's highly successful Search And Rescue 2 (SAR2). Where SAR2 had only a choice of 1 single helicopter to fly, SAR3 gives you 3 of the most renowned rescue helicopters used across the world.

Being a simulator, SAR3 intends to give you a real challenge as a pilot. The flight model, weather and object physics are very detailed, and will, combined with the stunning graphics, make you fully absorbed in handling and flying the helicopter. Many hours will be spent improving pilot skills and flight control, and this will in itself be a very entertaining part of the simulator.

Enjoy!

▶ System Requirements

To be able to play SAR2, your computer will have to meet the following minimum requirements:

Processor .....Pentium 166 MHz
Internal Memory.....32 MB
Graphics Card.....3D Accelerated card
Sound Card.....Any Sound card
Hard disc space .....315 MB
Operating System .....Windows 9x, with Direct X 5.0 or later.
Controllers .....Keyboard

For optimum game performance and playability we recommend that your computer specifications be as follows (or better):

Processor .....Pentium 500 MHz
Internal Memory.....128 MB
Graphics Card.....32MB 3D Accelerated card
Sound Card.....Any Sound card
Hard disc space .....315 MB
Operating System .....Windows 9x, with Direct X 5.0 or later.
Controllers .....Joystick, Pedals and Throttle stick.

Running the Search And Rescue 3 CD

Installing the Game

SAR3 supports the AutoRun function. If your computer has this activated the install start-up box should appear automatically after you have inserted the CD.

If AutoRun is not activated on your computer, you need to do the following:

1. Double-click on the icon on your desktop called “My computer”.
2. Find the icon for the CD-ROM drive (in the folder you just opened) and double-click on it.

The SAR3 install start-up box will appear on your screen. In this box you will see several buttons and drop down boxes, but only 3 of them are available on the first run of the CD:

- Cancel
- Install DirectX 8
- Install game

If you do not have a version of DirectX installed you will need to install this, otherwise you should go directly to installing the game by pressing “Install game”.

Installing the game is easy. Once you have agreed to the terms of the License Agreement, you should just follow the instructions on the screen.
The game will then start the installation from CD to hard disc. SAR3 needs to copy quite a large amount of data, so this process could take some time. Just wait patiently for the progress indicator bar to reach 100%.

When you have clicked “Finish” you will be returned to the start-up box.

Search And Rescue 3 Start-up Box

Search And Rescue 3 Start-up Box

When SAR3 has been installed and you run the game you will see the following functions in the start-up box:

Note*:* Avoid pressing the windows key while playing the game. Pressing this key will close the game.

You can now start the game by pressing the “Play Game” button, but before you do this it might be a good idea to take a look at the Graphics setup section. Here you can set up the in-game screen resolution and colour depth. This is done as follows:

Graphics device:

You can choose which graphics device or card that you want to use in the game. Depending on what hardware your computer has this will list a number of choices. You should choose the graphics device that supports 3D acceleration, or alternatively you can try the default “Primary Display Driver”.

Resolution:

The minimum and default in-game screen resolution is 640*480 pixels. You can choose a higher resolution from the drop down list. The choice will be limited to the resolutions supported by your graphic card.

Note*: Choosing a higher resolution will make the graphics inside the game look smoother, but it will also force your computer to work harder and could therefore slow the game down.*

Bpp:

Bpp is short for “Bits per pixel” and represents the in game colour depth. Choosing a higher number will increase the colour palette of the game.
The choice will be limited to the bit depth supported by your graphic card.

Quick Start Flight Manual

This section has been included to help you get through the start-up procedures and into the air without having to read through the entire manual first. Of course we recommend you do this later on, but we also know that you will want to get started right away.

Navigating Through the Front-end Menus

Search And Rescue 3 has an easy-to-use and intuitive menu system. It will be described in more detail later, but in this section you will learn just enough to be able to set up a mission and get to the action.

On the main screen you will see four buttons: Single mission, Campaign, Options and Exit.

The Exit button will let you exit back to your Windows desktop.

The Options button give you access to various control, sound and graphics settings. The most important thing for you to begin with will be the switch setting at the top of the screen called controls. This will let you choose whether you want to fly with keyboard, joystick or other game controllers.

The Single Mission button takes you to a menu where you can select which type of mission you want to play. This is the fastest way to get started.

The Campaign button opens the campaign system in the game. Here you can create a new pilot, and start a career as a RESCUE RULES AND officer.

We suggest you start by playing a few single missions. Later when you have familiarized yourself with the interface and controls, you can try a campaign session.

If this is your first flight with SAR3, you should not concern yourself too much with the choice of mission or helicopter. Just click through the menus and make any choice you like. The most important thing right now is that you get into the game itself.

Helicopter Simulation Physic Modes

There are three ways to fly the helicopter in SAR 3, Easy-, Arcade- or Realistic-mode. When you go through the steps of either the Single mission or the Campaign setup screen, you will be able to choose between these modes.

If you have no Joystick we suggest that you use the Easy or Arcade physics mode. The Realistic mode is best used with a Joystick, as it requires better and more precise control of the cyclic stick (flight stick).

On-screen Help

The first thing you will want to do when you enter the game, is to activate the on-screen help box. You do this by pressing “O” on the keyboard. This box will constantly keep you up to date on what you need to do in the game, and also give you hints to which buttons you need to press.

Flying the Helicopter

When you enter the game, you will either be stationary at the base, or hovering in the air (depending on the choices you made during the front-end menu selections).

Note: *If you are stationary on the base, you will need to start the engines. Pressing “R” once, followed by “E” and “T” twice each. (In Easy mode all you need to do is press “R” once).*

Before continuing you should take a look at the accompanying key-reference sheet. This shows all the function keys for SAR2, and how they are placed on the keyboard.
(Notice that the number keys on the numeric pad have different functions than the number keys on the main keyboard!)
Now you should take a look at the instrument panel in the cockpit. Enter the cockpit by pressing "1" on the main keyboard, then exit again by pressing "3". To look around in the cockpit use the glance keys (NUM PAD).

To rise and fall in altitude use the collective control keys "A" and "Z".
You can spin around your own axis using the tail rotor keys "X" and "C".

To control the cyclic stick use the arrow keys (or joystick if this is selected as controller).

Note: *Hover mode (F12) and Autopilot (F11) are not accessible when flying arcade mode!*

Finding the Mission Site.

When you have familiarized yourself with the basic flight controls of the game, you should try playing through your selected mission.

As a start you should take a look at the cockpit instrument panel. (You gain access to a 2D instrument panel by pressing "Q"). Your main concern right now is the onboard computer screen (The big black screen, with the green digital display, also called HSVD).

The main purpose of the computer is to give the direction and distance to the mission target. Try changing the heading of the helicopter while looking at the computer screen (use the tail rotor keys "X" and "C" or pedals if equipped). Now you will see the navigation pointer turning. The helicopter nose is pointing in the right direction when the arrow is pointing upwards (12 o'clock position).

To find the mission target, fly in the indicated direction until the distance counter reaches 0. The distance to the target is shown in the upper right corner of the onboard computer screen.

At one point you will have to use the "time jump" function. You can activate it yourself by pressing the "L" key. The time jump function will take you to the area containing the next waypoint in the mission.
*(***Note***: The time jump function will activate automatically if you fly out of the flight areas boundaries. If you are heading in the direction of the mission target, you will jump to the mission area, otherwise you will be repositioned back to the original area).*

Rescue Procedures.

The actions to be performed at the mission site will vary depending on what kind of rescue type is required. You may need to have a look at the briefing again (press "F1" to read the briefing again). The briefing should explain what procedure you should use in that specific situation.

When you have picked up all mission targets, a message will notify you to head for the next waypoint. Some missions will require you to make a stop at a RESCUE RULES AND base or a

hospital before returning to your own base. In this case you should land on the roof of the building, after which a message will tell you that you can fly to the next waypoint.

Finishing the Mission.

A mission is considered successful when you have safely completed your mission goals. In some missions this may require you to deliver survivors at a hospital, where in other missions it may be to check the identity of a vessel using the radio.
When the missions is considered completed you may exit the mission by pressing “ESC”.

The Menus

▶ This section will explain all features of menus in SAR3. We will go through each screen one by one, and explain each button and text as we go along.

Search And Rescue 3 - Main Menu

Single Mission

Here you gain access to the single mission features and screens. There you can set-up and play a single mission chosen from the entire mission list.

Campaign

In the campaign you can start a new pilot, or load an existing one. You will then gain access to your pilots career data, and continue the service in the RESCUE RULES AND, flying more missions!

Options

Here are set-up screens for graphics, controls and sound.

Exit

Here you can exit the game, and return to your windows desktop.

Single Mission Settings menus

This section will explain all features of the single mission screens, and will allow you to set-up a custom rescue mission.

Choosing a Mission

This screen shows a list of all missions in SAR 3, and will also let you set up certain flight settings for that mission. You can scroll down the list of missions using the scroll bar (or arrows) on the right.
If you click with your left mouse button on a mission name, you will see that it is highlighted by a blue box. This means that you have selected that mission.

When you have chosen mission and modified the desired options, click “OK”.

If you want to go back to the previous menu, click “Back”.

Choosing the Single Mission Flight Settings

The right side of the screen holds a panel with a number of buttons. Each button will let you customize a particular flight setting.

Below is an explanation of each button and the setting it affects.

Physics Switch

Mouse click on the metal switch with the mouse to select between the three settings: Easy, Arcade or Realistic. The difference between these is described later in this document, but as a rule you should select “Realistic” for sensitive control, and “Arcade” for safer flight, and “Easy” if you are a beginner and have no joystick.

Weather

The weather setting you chose will influence wind, light, visibility and rainfall. You change between the settings by clicking on the dial button.

Each setting is shown as a small icon, graphically illustrating the weather type it represents. They are explained below (Note that the wind strengths below show the constant “back-ground” wind, but that occasional wind gusts more forceful can be experienced):

Sunny: The visibility is very good and the wind is light.
This is by far the easiest setting!
Wind strength between: 2-10 knots

Overcast: The sky is grey and the mood is gloomy, but flight conditions are still good.
Wind strength between: 6-20 knots

Fog: A dense fog covers the landscape, and long-range visibility is poor. Helicopter control is still easy though!
Wind strength between: 2-6 knots

Rain: Rain and fog makes visibility poor.
The wind is also slightly increased.
Wind strength between: 6-30 knots

Storm: Wind is strong, making control of the helicopter challenging. Additionally you will have to fight with both fog and rain.
Wind strength between: 10-30 knots

Hurricane: This is absolutely insane. Normally an aircraft would not go up in this weather, but if you are up to the challenge, here you get the chance.
Wind strength between: 30-60 knots

Random: If you want to have the computer chose for you, this is the setting to select. The computer makes a random selection of the previous six weather types. The result will then be shown on the mission briefing screen.

Time of Day

The time of day setting you chose will mostly influence the light level in the game. You change between the settings by clicking on the dial button.

Each setting is shown as a small icon, graphically illustrating the time of day it represents. They are explained below:

Morning: The morning is misty and cold.

Mid day: This is the normal setting for a rescue flight. The sun is high and the light is good.

Evening: The sun is setting and the sky is red with its last rays.

Night: It is pitch dark. This is not a setting for beginning player. It will be nearly impossible to find any visual fix points, and you will have to rely heavily on instruments.

Random: If you want to have the computer choose for you, this is the setting to select. The computer makes a random selection of the previous four types. The result will then be shown on the mission briefing screen.

Start Position

Here you choose where to start the mission. The most realistic setting is of course to start from the base, but for training purposes we have included the other two possibilities.

Base: The helicopter stands stationary, with the engines off at the base. You will need to go through the start-up procedure and power up the engines before you can take-off.

Hover: The helicopter is hovering in the air just over the base. You are ready to turn your bearing towards the mission site. This setting can be used if you do not want to go through the entire start-up procedure.

Mission site: The helicopter is hovering near the mission site. This setting is good when you want to practice the rescue procedures used for each accident, without having to fly all the way to the site first.

Crashes Off

This button looks like a light. You alternate between the settings by clicking on the light switching it on or off.

Off: Choosing yes will make your helicopter indestructible. You will be able to collide with any obstacle without inflicting any damage on hull, wheels or rotor. Additionally you will never encounter damage on engines and gearboxes nor be able to over-speed rotors.

On: Your helicopter will take damage and possibly be destroyed if you collide with anything.

Time Limit Off

This refers to the optimal time limit within which the mission must be completed to avoid getting a deduction in points.

Off: Time limit is off, and you will not be penalized for completing the mission using more time then optimal. However you will still have to deal with the survivors and their worsening health condition.

On: The time limit is on. The player will be awarded for fast completion of the mission.

Mission Briefing

This is the mission briefing. Information details about the mission are given here.

When you have read the text and are ready to fly, click “Take off”.

If you want to go back to the previous menu, click “Reject Mission”.

Below is a description of each entry.

Mission Settings

The left side of the screen is now locked, but it stays to remind you of the current weather and other mission settings.

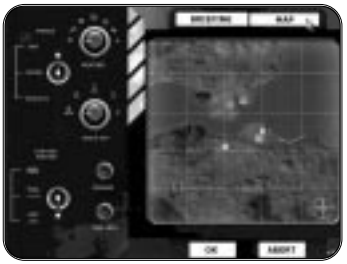
Mission Description

The mission description box holds several elements. First of all it shows the time of day (Hours: Minutes) and the Distance to the mission site (from the start position of the helicopter). You are not obliged to use this information, but they are helpful. It also shows the wind strength and the direction.

The central text gives a short description of the accident that has happened. Sometimes you will learn a lot from this briefing, such as number of victims, victim condition or hints on rescue procedures, but more often the information available is limited to hints or suggestions.

At the bottom of the text box is shown the estimated mission time. This is not the time you will need to spend in front of the computer, but it is the time that the missions would take in reality. (The SAR3 time-jump function cuts away much of that time).

Map



The mission-briefing map shows an overview of the area in which the mission/ accident site is located. (During flight you will also be able to access this map by pressing “F1”, and then it will show the area over which you are currently flying.)

Important locations are marked on the map using small icons.
The icons used are explained below:


The helicopter.


Mission waypoint marker.


Helicopter landing pad.


Airport.


Theme park.


Cable rail.


Factory.


Harbor.


Hospital.


Nuclear plant.


Pier.


Racetrack.

Selecting a Helicopter

The last choice you will need to make is which helicopter you would like to fly. You select helicopter by clicking the buttons at the top of the screen.

When you have made your choice of aircraft for the mission, click “FLY”.

If you want to go back to the previous menu, click “BACK”.

Campaign

The following section will describe the screens related to playing a campaign.

Setting up Pilot and Campaign

This screen shows a list of slots. Each slot has room for one pilot name. The text "- Empty slot" means that no pilot has yet been created there.

You select a pilot (or an empty slot) by clicking on the name. You have selected a pilot when the slot is lit with a dark blue background. When you have selected a slot you will be able to access/ modify it by using the buttons on the bottom left. They are explained below.

Click the "Back" button if you want to exit the campaign menu.

New Pilot

Clicking this button will create a new pilot in the selected slot. If you try to create a new pilot in a slot already used by another name, you will be given a choice to continue (and delete the old pilot) or to cancel.
If you go on to create a new pilot you will enter the "New Pilot" menu screen (described later in this manual).

Load Pilot

If you want to continue a campaign with a pilot already created you will have to load his information. Select the pilot name from the list, and press this button. You will then enter the "Running Campaign" screen (described later in this manual).

Dead Pilots

If you see this skull icon next to a pilot's name it means that he is dead. You will still be able to load his data and review his log (as long as you do not overwrite him with a new pilot), but you will not be able to continue the campaign.

Creating a New Pilot

Here you can create your new campaign pilot. This data will be used throughout the campaign of that pilot and cannot be changed later on. It is therefore important that you think about what you want before selecting the options. (See descriptions below).

When your pilot has been created and you are ready to continue, press: “Add Pilot”.

If you change your mind and want to return to the campaign menu, press: “Back”.

Pilot Name

Click on the empty box to type in the name. The mouse cursor will disappear while you type the name. When you are finished and have typed in the name you want press return. This will give you back control of the mouse.

The pilots name has no influence on the game itself. It will only be used on the “Hiscore” (High score) list and for saving the pilots data after each mission. You can therefore choose any name you want.

Physics Switch

Mouse click on the metal switch with the mouse to select between the three settings: Easy, Arcade or Realistic. The difference between these is described later in this document, but as a rule you should select “Realistic” for sensitive control, and “Arcade” for safer flight, and “Easy” if you are a beginner and have no joystick.

Immortal Pilot

On: Your pilot can never die. Even if you suffer a total crash during a mission, and the helicopter explodes into a thousand pieces will he be able to go on.

Off: Your pilot is mortal and will die if you suffer a serious crash during a mission. If your pilot dies the campaign is terminated and you cannot continue with the pilot.

Crashes Off

On (Selected): Turning the light on will make your helicopter indestructible. You will be able to collide with any obstacle without inflicting any damage on hull or rotor. You will still be able to encounter engine failures or other flight problems though.

Off (Not Selected): Your helicopter will take damage and possibly be destroyed if you collide with anything. If this happens you will be penalized with points during the debriefing.

Time Limit Off

This refers to the optimal time limit within which the mission must be completed to avoid getting a deduction in points.

On (Selected): There is no limited amount of time within which the mission must be completed, and you will not be penalized for completing the mission using more time then optimal. However you will still have to deal with the survivors and their worsening health condition.

Off (Not Selected): There is a limited time to complete the missions. The player will be awarded for fast completion of the mission.

Replay Option

On (Selected): You will be able to cancel the outcome of a mission, by choosing the replay option on the debriefing menu. This is good if you have made errors during a mission, but is of course not very realistic.

Off (Not Selected): There is no option to undo/ replay a mission. Once the mission is completed you are forced to accept the outcome, and take any consequences it might have on your pilots career.

Realism Level

This is not an option, but shows the sum of the realism percentages of the above chosen settings. This has no influence on the game itself, but it will influence the amount of points gained after each mission. In this way you will earn less points for flying easy, and more points for risking your neck (like a real RESCUE RULES AND pilot).
Full point (100% realism) is obtained by choosing no to all realism settings.

Running Campaign

This screen holds all information about the pilot and his career. It is the main screen of the campaign and from this screen you gain access to all other things related to your pilots career.

The two buttons at the top of the screen will switch the information in the display area between “Campaign” information and the pilots “Log” file.
(The content of each screen is described below).

The “Training Mission” button in the lower left corner will let you fly a mission that will not influence your pilot’s career, though it will be recorded in your Log.

To play the next mission in the campaign, press “NEXT MISSION”.

To go back to the pilot screen, press “BACK”.

To go back to the campaign screen, press “Exit Campaign”.

Campaign Information

Pilot Name
As mentioned before the pilots name has no influence on the game itself. Here it is used to inform you of what pilot you are playing now.

Pilot Rank
This is a little bit of spice included from the real RESCUE RULES AND service. Here you are given ranks according to the number of flight hours you have in the helicopter. We have adjusted the
ranking system a bit to fit SAR 3 but it should still resemble real life close enough.

You will gain rank in the following way:

Rank	***Required***
Ensign, Level 1	0 Flight hours and 0 successful missions.
Ensign, Level 2	20 Flight hours and 12 successful missions.
Lieutenant junior grade	40 Flight hours and 30 successful missions.
Lieutenant	80 Flight hours and 60 successful missions.
Lieutenant commander	120 Flight hours and 90 successful missions.
Aircraft commander	200 Flight hours and 120 successful missions.

Missions
Here you can see the number of missions flown opposed to the number of successful ones.

Mission Goals
Here you can see how many mission goals you have completed out of the number encountered. Mission goals include injured people needing to be saved, objects to deliver or vessels to inspect.

Flight Time
Flight time shows how much time you have spent in front of the computer with this pilot. It will gradually increase as you fly more missions.

Note *that this is not the time we base the gain in rank on. (Later in this document you will see that we operate with two different times for a mission: Flight time and Mission time.)*

Score
Shows how many points this pilot has scored throughout his career.

Pilots Log Information

The Pilots Log is a tool to help you remember what you did and what should not be repeated. It is a mix between a real pilots log, with information about the mission and the helicopter, and a game log keeping track of points and progress. The Log is essentially a text file, which is updated every time you finish a campaign mission. Each mission has its entry with information of how things went.

Debriefing

After completing your flight session (even if you crashed) you will come to the "Debriefing" screen. Here you get information about the outcome of the mission, and how you handled yourself and the helicopter.

On the right side of the screen are the points given for each accomplishment. They are added together, and the total is given in the lower right corner. However the total will never be negative, even if the sum of points given to you is negative. You will never get lower then 0 points. Additionally you should note that the Realism Level modifies your point total (slightly).

The left side of the screen show you the settings as they were for the mission. These are shown for reference purposes, and you will not be able to handle the buttons or switches in any way!

When you have read the "Debriefing" and are satisfied with the result, press "OK". Depending on what kind of mission you had been flying you will then return to either the "Single mission" menu or the "Running Campaign" menu.

If you are dissatisfied with the result, you will be able to fly the mission over again by pressing "Replay Mission".

Note*: This function will not be available if you are playing in Campaign mode and have clicked the replay option off for your pilot!*

Mission Outcome

This is the primary parameter for success or failure. You can encounter the following outcome messages:

Message	Explanation
Successful	You have returned to the base and all mission goals have been completed.
Failed	No mission goals obtained, or helicopter crashed.
Partly successful	You have returned to the base but only some mission goals were completed.
Not completed	The mission was exited before final touchdown at the base.
Mission failed, Pilot dead	You crashed and the pilot was killed.
Free flight mission	The mission is a free flight mission and no points are given.

Mission Goals
Here you can see how many mission goals you have completed on the mission. Mission goals include injured people needing to be saved, objects to deliver or vessels to inspect.
An injured person mission goal will only be considered complete if he has been safely delivered to the drop-off site/ hospital. *(I.e. if he dies in the helicopter before drop-off you will not be awarded points).*

Mission Time
Here you get points for completing the mission within the estimated (optimal) mission time (*See "Briefing screen"*). You get points for completing the mission faster than estimated and are deducted points for being too slow!

Helicopter Damage
Here you are informed about any damage you may have inflicted on the helicopter during the mission. Points will be deducted for damages (of course).

Errors
This is a list of errors that you have made during the mission. Often these errors will come from breaking the RESCUE RULES AND rescue procedures or from violating standard helicopter flight rules. Points will be deducted for each error you make, and the total can be seen in the point box to the right of the "errors" text.
(A complete list of errors that will be reported can be found under "Rescue procedure errors" later in this document).

Realism Level
This is just for your reference a reminder of the realism level set during your pilot creation. This number represents the percentage of the point sum you will be awarded.

Options

This screen has 3 sub screens, which can be selected using the flags at the top: Graphics, Sound and Control. Each sub screen is described below.

When you have finished modifying the option screens you can press "OK" to get back to the main menu!

Options Screen

Options / Sound

Here you set up the sound volume for Voice, Sound Effects (SFX) and Music. You use the sliders to set each parameter from 0% on the left to 100% on the right.

Options / Graphics

Here you set up the graphical detail level of the game. You use the sliders to set each parameter from 0% on the left to 100% on the right.

Remember that higher detail level will result in a lower in-game frame-rate, but in return you get a much more eye pleasing flight environment.

Landscape Detail

Here you set the polygon detail level of the landscapes height structure. Low settings will make the landscape seem more "square" and a high setting will make it look smoother.

Object Distance

This slider actually has 5 settings, and will snap to the nearest when you drag the marker. It is the setting for the surface detail level of the landscape. Low setting will make the landscape coloring look low, and a high setting will make it look more detailed and varied.

Tree Detail

This defines the density of trees in the landscape. Low setting will make the tree areas less dense (0% will remove all trees), and a high setting will make tree areas denser.
Note that some areas have no trees even at the highest tree Detail level!

Building Density

This has been included mostly to increase the frame rate speed over the bigger cities. Low setting will remove houses from the city (but also rural areas), and a high setting will put more buildings in the city.
Note: If you want to see the cities as we have created them, you will need to set this to 100%.

Lens flare

This is an On/Off switch. You can remove the camera lens flare effect of the sun by choosing the no switch.

Poles

Again something we have included to help you increase the frame rate speed on slower machines. You can remove all Electrical Wire masts by choosing the no switch.

Options / Control

This menu will let you set up which control device to use for flying the helicopter. You can set up Joystick axis's X, Y, Z and R. Additionally you can set up mouse X and Y axis's and the Keyboard as well (Though there is no function to set up individual keys, which means you will always have to use the keyboard for other functions then those mentioned on this screen!).

Use the arrow keys to select which axis to use, or alternatively you can try the preset buttons.

The column called "Inv." is used for inverting the poles on the axis.

Here follows an explanation to the different axis (Note: before you try to set up your control device manually we recommend that you have a look at the preset buttons explained later in this section.)

Axis on the controller	**Explanation**
Axis X	This sets the controls for the left / right movement of the controller.
Axis Y	This sets the controls for the forward / backward movement of the controller.
Axis Z	If your joystick has a slider / throttle, it will most likely be this axis.
Axis R	This is usually the axis used for pedals.

Pitch

Changing "pitch" is the same as raising or lowering the nose. The normal controller used here is the Joysticks Y axis.

Roll

The helicopter is "rolling" when it is tilting from right to left. The normal controller used here is the Joysticks X axis.

Collective

The collective stick is used to raise and lower the altitude of the helicopter. Normally this is set to keyboard, unless you have a collective slider or stick on your joystick.

Tail Rotor

This is used to change the heading of the helicopter at low speeds. Normally this is set to keyboard, unless you have a set of pedals attached to your computer.

Presets

We have included these preset buttons to ease the process of setting up controllers for SAR2. Each button represents a specific preset control set up as explained below.

If you start modifying any of the preset set-ups the light will switch off to indicate that you are no longer using a preset.

Keyboard only.

Joystick only.

Joystick with Throttle stick (collective).

Joystick with Throttle stick (collective) and pedals.

Mouse control of pitch and roll.

Custom setting. Changed to fit desired controller set up by the user.

Helicopter Info

This screen is a graphical and visual information screen, listing all the technical data of the HH-65 Dolphin helicopter, as well as displaying a hires animation of the helicopter.

During a Mission

▶ This section will deal with the basic functions of the in-flight part of SAR 3. It will explain anything you need to know about the game play of SAR 3, except details about flying the helicopter and following the rules of the RESCUE RULES AND, which will be explained elsewhere in this manual.

Camera Views

The main game screen shows the flight landscape and the helicopter from an angle set by the selected camera (keys 1-to 0 on the keyboard). The default start screen shows the helicopter from behind (Camera 3) and the lower part of the screen shows the 2D instrument panel (toggled with “Q” on the keyboard).
For each camera you will be able to set the panning angle. This is done with the numbers on the numeric keypad. Each camera will pan differently from the others.

Below is a description of the three most important view angles.

Tail Camera (Number 3)

This is the default camera view, and is considered the easiest way to fly the helicopter. It is of course not a very realistic viewpoint, but it will help you to judge the distance to the ground and objects easier. Additionally you will have a good view of the surrounding landscape.
This camera is also good in hoist situations, especially if you pan the camera to get the hoist door in sight.

Cockpit Camera (Number 1)

This is the most realistic viewpoint from which to fly the helicopter. You see the inside of the cockpit from the seat of the aircraft commander, and your view of the surrounding landscape is limited accordingly. Your pan keys are also important here, but you will then often be using them to look at the landscape outside, trying to get a fix point or to judge the exact position over an object.
This view is more difficult then the Tail Camera, but will probably give you a better "realistic" feeling of the helicopter..

Hoist Camera (Number 2)

This is the view of the Flight Mechanic looking out of the hoist door. If you want to stay as close to real life as possible this is the camera to use during a hoist. From here you will be able to scan the water surface for drifting survivors, but also follow the progress of the rescue swimmer.

Other Cameras

Here is a list and brief description of all cameras in the game.

Camera	*Description*
Cockpit Camera (Key 1)	This is the pilot chair view. (Explained in depth above)
Hoist Camera (Key 2)	This is the view of the Flight Mechanic. (Explained in depth above)
Tail Camera (Key 3)	This is the default rear view. (Explained in depth above)
Trace Camera (key 4)	This is much like the Tail Camera, except it has a smooth follow curve.
Right Side Camera (Key 5)	The helicopter seen from the right. Good for hoist operation.
Left Side Camera (Key 6)	The helicopter seen from the left.
Top Camera (Key 7)	Top view of the helicopter. Good for getting into position above a target.
Bottom Camera (Key 8)	The helicopter seen from below.
Circling Camera (Key 9)	A camera that rotates around the helicopter, but constantly facing it.
Fly-by Camera (Key 0)	A camera fixed to one point, but following the helicopters movements.

Transparent Cockpit Option

During flight and especially landings it can often be difficult to see anything just outside of the cockpit. This is often the problem with computer flight simulators, where you (as a player) do not have the same ability as a real pilot to move your head to the side, or lean forward in the seat. Of course SAR3 offers the ability to look around inside the cockpit, but not to the same extent as a real flesh-and-blood pilot is able to do.
To compensate for the lack of visibility we have added the "Transparent cockpit function". You can activate this function only when you are inside the cockpit and press the designated key (default this is "U"). The cockpit will then become transparent, and your field of vision is greatly increased. This should help you during difficult landings and low altitude hovers.

Mission Flow

Generally speaking all missions follow the same pattern. There is a series of steps necessary to complete the missions in SAR3 (as well as in real life RESCUE RULES AND rescues), and you will be expected

to master all to perfection if you want to attain the highest rank of the game. Here each step is explained in brief:

Step	*Description*
1: Engine start	Making checks and starting the engine (See “Take off and landing”)
2: Take off	Lifting off and attaining hover (See “Take off and landing”)
3: Finding the site	Gaining speed, finding the direction. (Possibly also time jumping)
4: Rescue check	At the site. Making the rescue check (See “Rescue and secure checks”).
5: Rescue procedure	Picking up survivor/ mission objective (See “Rescue procedures”).
6: Check survivor condition	Checking survivor injuries (See “Survivor condition”)
7: Secure check	Securing cabin, gaining speed (See “Rescue and secure checks”).
8: Drop off survivors	Landing at hospital or drop-off site. Delivering survivors.
9: Return to base	Back to base. (Possibly also time jumping)
10: Landing	Slowing down and landing (See “Take off and landing”)

(Note: Some missions will of course deviate in one way or another from this step by step procedure).

Campaign Flow

The flow of each individual mission in the campaign is just like that of the single missions (explained above), but the order in which you play and generate missions is different and randomly chosen by the computer.

Randomly Generated Missions

Each time you play a new mission in a campaign the computer will randomly set up a mission based on a set of parameters. First of all the mission will be chosen based on your rank. All the missions in the game have a difficulty level matching one of the ranks that your pilot can gain. The computer selects a random mission from between all the missions having a difficulty low enough for your rank.

Then the computer will randomly set the weather type and time of day. This selection is again restricted somewhat by your rank, making low ranked missions easier. (I.e. you will not be allowed to fly night missions as an ensign!)
Finally the location of the mission site is set. Even this is randomized somewhat, where the computer selects between a set of predetermined locations appropriate for that mission type.

The above system makes virtually all missions in the campaign different, and each campaign will therefore vary both in difficulty and “story line”.

Flight Area

There are 10 different landscapes in SAR 3, all of which spans 20x20 kilometers. To fly over a specific landscape you will have to choose one of the free-flight missions, where you can fly freely with no mission limitations or time jumps.

Reason for Limited Areas

The landscape system is based on the same concept as in SAR 2, where flight was limited to an enclosed map. The reason for the limited area size is that we wanted to have as high a ground level detail as possible. During research and based on feedback from real pilots, we realized how important static fix-points in the landscape are for maintaining hover position and visually judging altitude. Therefore we have chosen to include a very high ground detail level, both with the number of objects and with the ground textures.

Time Jump

As mentioned above, each area in SAR3 covers 20x20 kilometers. However as most missions start in one area with the accident site in another, you will need to switch to the second area at some point during the missions. The process of switching landscapes is called "time jumping". There are two ways in which a time jump can be activated: voluntary and forced. A forced time jump occurs when the player nears the edge of the 20x20 kilometers landscape. You will be given a warning that you are close to the edge, and that time jump is necessary, but if you do not heed this (turning back) you will time jump automatically.
A voluntary time jump occurs when the player uses the "L" key to time jump to the next waypoint in the mission. However several criteria have to be met before this is possible. These are:

1: The next Waypoint of the mission has to be in another area.
2: The helicopter has to be flying at airspeed higher then 40 KIAS.
3: The helicopter has to face in the general direction of the waypoint (as indicated on the HSVD instrument).

Effects of a Time Jump

When you time jump the helicopter is moved to the edge of the target area in an instant. The screen fades to black, while the computer loads the new area into memory. When the screen fades up again you will find yourself in the air flying at approximately 120 KIAS, and heading straight for the waypoint.
Even though the flight between the areas is not played in the game, it will still be calculated into the mission time. This also means that fuel is used and time passes for the victims.

Point System

We have decided to include a point system in SAR3 because it is a good way to award players according to their performance. This is especially true for the RESCUE RULES AND rescue elements of the game, where several rules and procedures have to be followed in order to make a safe rescue (See the "RESCUE RULES AND rescue procedures" section for more details).

The point system is completely independent from the rank system (explained under the "Running Campaign" menu screen). This means you can have a huge amount of points and still be an ensign.

(See also the "Debriefing" menu screen description)

Rescue Rules and Procedures

▶ This section explains how to use the rescue diver and what the rules of the game are. They are based on the RESCUE RULES AND rescue procedure rules, modified to fit the game play of SAR3.
Many of the rules can be broken, while still completing the mission, but doing so will result in a point penalty awarded at the debriefing. So completing a mission perfectly is not only a question of being able to fly the helicopter, but also a matter of following the rescue rules.

Rescue Equipment
A rescue helicopter is rigged with lots of gear and devices. Of most importance to SAR 3 are the three rescue devices: Basket, Sling and Litter. Each one of these is used attached to the hoist cable as a method to transfer the hurt and injured into the helicopter.

Rescue Basket
The rescue basket is the primary device for hoisting individuals in most situations. It affords a measure of protection for the individual being hoisted from vessel rigging etc., particularly for an untrained person.
The rescue basket is used when hoisting survivors suffering from mild to medium injuries.

Sling
The sling is an efficient method to deliver and pick up personnel trained in its use. Due to the danger of falling out, it is not recommended for use with those not specifically trained in its use.
The rescue sling is used when hoisting unhurt individuals or rescue personnel.

Litter
In rescue situations where the survivor is incapacitated, the rescue litter is used. The litter is more difficult to use in a hoist, primarily due to its larger size and sail area.
The rescue litter is used when hoisting badly hurt or dying survivors.

Spotlight
Each helicopter is fitted with spotlight (also called search light). In real-life this spotlight is controlled by the pilot or the flight mechanic using a small joystick placed inside the crew compartment. The spotlight is used at night or in poor visibility conditions to search for survivors on the ground or in the water.
In SAR3 the spotlight is fully controlled by you. You can turn the spotlight on and off using the (default) key “F9”. You can move/ aim the spotlight by holding the CTRL button while using the NUM PAD keys for direction control.

Flight Crew

Pilot
In essence you take the role of the pilot, being responsible for the safe and orderly conduct of the flight. You are in full control of the helicopter controls, and the commander of solving the mission. (The crewmember you see sitting next to you inside the cockpit is the co-pilot, but you will have no control of his actions).

Flight Mechanic
The flight mechanic is the person responsible for control of the hoist. He is also the one in command of the rear cabin in the helicopter, and is trained to check the condition of the survivors once they are picked up.
You have control of most duties belonging to the flight-mech, including hoist operation, rescue

swimmer deployment, supervising external load operations, cargo loading and off-loading, operating the hoist door, visual area search, and deploying rescue devices.

Rescue Swimmer

The rescue swimmer is trained to be deployed from the helicopter and act independently while preparing survivors for pickup. When the rescue swimmer is used, the swimmer will participate in the on-scene evaluation, and advise the flight-Mechanic (player) on which rescue device to lower according to the victim's condition.
The rescue swimmer has the authority to decline deployment if the situation is beyond the swimmers capabilities (though you will be able to drop him above the maximum drop height).
The rescue swimmer is used in many different ways, both over water and on land, and can be deployed both by hoist and by dropping from the helicopter (called "free fall").

Rescue and Secure Checks

During a mission when you get ready to commence with the rescue procedure, there is a set of checks that has to be made (both before and after the main rescue procedure). The before-check is called "Rescue check" and the after-check is called "Secure Cabin check". In SAR 3 the Flight mechanic and Pilot will go through these automatically once you have opened the hoist door. They are listed here for reference reasons, but also because it is important that you wait for them to be completed before you go on with the main rescue procedure.

RESCUE CHECK

- Hatch open. .....("F2")
- Hoist power.....Flight Mech says, "Request Hoist Power".
- Hoist rigged. .....Device or diver gets ready for procedure (Attached to hoist or ready in door).
- HOT MIC on. .....Flight Mech says, "HOT MIC check".
- Ready. .....Flight Mech says, "Rescue check complete, ready aft for ____". (The empty line indicates that the ready message will vary from each rescue procedure type.)

(After this the appropriate rescue procedure will commence)

SECURE CABIN CHECK

(This check is made when the rescue procedure ends, and the cabin door (Hatch) is closed, and the HOT MIC is off.)

- Hatch Closed. .....("F2")
- Hoist boom. .....Flight Mech says, "Boom stowed, ready for forward flight".

The Flight Mechanic must stand by the Cabin door until safe single engine speed (40 KIAS). When 40 KIAS has been reached the check will continue.

- Hoist power request. .....Flight Mech says, "Secure Hoist Power".
- Secured. .....Flight Mech says, "Cabin Secure".

Rescue Procedures

This section describes how the functions and procedures for rescuing people works in SAR 3. It will give a detailed description of each of the mission types in the game, and how you should act at the mission sites.

Procedure Descriptions

In Search And Rescue 3 each mission must be completed using one of 8 rescue procedures.

Each of the 8 procedures has been created to mimic the United States Coast Guard procedures as closely as possible. In this manual we will explain only what is needed to go through the procedures in the game, and if you want to know more about the real-life rescue procedures, we suggest that you contact your nearest air-rescue station.

When you play a mission you should be able to deduct which procedure to use by reading through the briefing text carefully. This will give a clear short description of what you must do when you arrive at the mission site. Each of the mission types are described in the following procedure:

Required Action at Site	***Procedure Described in Section***
Land & pickup using stretcher	Stretcher deployment.
Land & deliver	Land and deliver.
Land on object & deliver	Land and deliver.
Direct hoist deployment of RS	Direct deployment. (Using the rescue diver)
Radio inspection	Radio inspection.
Hoist object up from target	Hoist pickup.
Hoist object down to target	Hoist delivery.
Free fall or sling deployment	Free fall or sling deployment. (Using the rescue diver)
Free flight	Free flight (not really a rescue procedure).

Stretcher Deployment

This procedure requires the pilot to land the helicopter, so that the stretcher carriers will be able to exit the helicopter.

1. The pilot establishes the helicopter in a stable hover placing the survivor at the one - to - two o'clock position, well outside the rotor wash. Then touches down to a stationary and secure position, and the pilot reports, "We have touch down".

2. When the rescue check is complete (you must open the door to activate it), the FM reports "Rescue Check Complete, Ready aft for Stretcher Deployment."

3. The pilot voice directs "Go on HOT MIC," "Check Stretcher".

4. The FM responds "On HOT MIC," "Checking Stretcher". When this is done the FM reports "Stretcher Ready".

5. The pilot commands, "Deploy stretcher".

6. You are now allowed to deploy the stretcher ("F3"). When this is done the FM reports "Stretcher on the ground," "Moving for survivor".

7. Once the rescue is complete, with stretcher and all survivors aboard, FM reports, "Stretcher in Cabin." You will then be required to close the door before he reports "Going off HOT MIC", and begins secure check. The pilot maintains position until FM reports, "Ready for take-off".

Land and Deliver

This procedure requires the pilot to land the helicopter, so that the passengers or cargo can be delivered safely.

1. The pilot establishes the helicopter in a stable hover above the touch down area. (In most cases you will be required to find a suitable location based on your own judgement). Then touches down to a stationary and secure position, and the pilot reports, “We have touch down”.

2. Now the FM will direct, “Open the door to unload passengers/ equipment”. You can now close the door, take off and return to base.

3. When all has been delivered the FM reports “Passengers/cargo delivered”. You can now close the door, take off and return to base.

Direct Deployment

This procedure includes the Rescue Swimmer. In a Direct Deployment the RS uses the seat harness and remains attached to the hoist cable throughout the rescue process. The RS is lowered to the survivor, applies the quick strop and indicates ready for pickup. The swimmer and survivor are hoisted together!

1. The pilot executes an approach to a hover with the survivor(s) at the one - to - two o’clock position, outside the rotor wash.

2. When the rescue check is complete (you must open the door to activate it), the FM reports “Rescue Check Complete, Ready aft for Direct Hoisting.”

3. The pilot voice directs “Go on HOT MIC,” “Check Swimmer”.

4. The FM responds “On HOT MIC,” “Checking Swimmer”. When this is done the FM reports “Swimmer Ready”.

5. You are now allowed to deploy the swimmer to the rope (“F4”). When this is done and the swimmer is attached to the rope, the FM reports “Swimmer outside door,” and will continue to report the swimmers location throughout the hoist.

6. When the swimmer touches the ground, FM reports “Swimmer in contact with the surface”. Once secure footing has been established, the RS approaches the survivor via walking/ rappelling, and you must lower the cable to let him move freely.

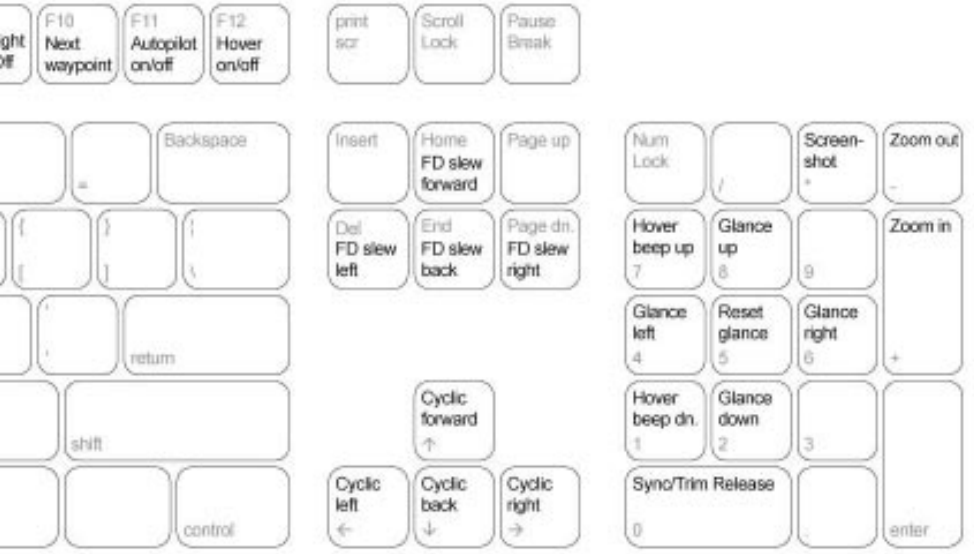
7. When the swimmer reaches the survivor, he will prepare the survivor for pickup (securing him in the quick strop). When the survivor is secured and ready, the FM will report “Ready to be hoisted”.

8. Once the rescue is complete, with swimmer and all survivor(s) aboard, FM reports, “Swimmer in Cabin.” (You must remember to unhook the hoist device as well (“F6”)).

9. You will be required to close the door before the FM reports “Going off HOT MIC”, and begins secure check. The pilot maintains position until FM reports, “Boom stowed, ready for forward flight”.

10. Finally when a steady rate of climb and 40 KIAS has been reached, the FM finishes with the secure check.

Keyboard Reference Sheet


F10
Next waypoint
F11
Autopilot on/off
F12
Hover on/off
print scr
Scroll Lock
Pause Break
Backspace
return
shift
control
Insert
Home
FD slew forward
Page up
Del
FD slew left
End
FD slew back
Page dn.
FD slew right
Cyclic forward
Cyclic left
Cyclic back
Cyclic right
Num Lock
Screen-shot
Zoom out
Hover beep up
Glance up
Zoom in
Glance left
Reset glance
Glance right
Hover beep dn.
Glance down
Sync/Trim Release
enter

Radio Inspection

This is not actually a rescue procedure, but will be considered as such in SAR2 game terms. Here the pilot makes a radio call to a vessel, checking its registration numbers or customs codes.

1. The pilot executes an approach to a hover near the vessel to be inspected.

2. When he is within range he will make a radio call, reporting to you "Inspecting Vessel." (You will not hear the exact content of the radio communication).

3. When an inspection of one vessel has succeeded the pilot reports "Vessel Inspected". If there are more vessels to inspect you will then have to close in on these as well, but if there are no more and all vessels have been cleared the procedure will go on to next point.

4. When all information has been gathered from all vessels the pilot reports "Inspection Completed," "Return to Base".

Hoist Pickup

This procedure is used when something is hoisted into the helicopter without the help of the Rescue Swimmer, and usually it requires the use of one of the three rescue devices described elsewhere in this document.

1. The pilot executes an approach to a hover above the survivor or object to be hoisted.

2. When the rescue check is complete (you must open the door to activate it), the FM reports "Rescue Check Complete, Ready aft for _____ Deployment." (The empty line indicates that the report will depend on what device must be lowered, and so it will in the following text. The devices are Basket, Sling or Litter).

3. The pilot voice directs "Go on HOT MIC," "Check _____".

4. The FM responds "On HOT MIC," "Checking _____". When this is done the FM reports "_____ Ready".

5. You are now allowed to deploy the designated device to the rope (using either "F5", "F6" or "F7"). When this is done and the device is attached to the rope, the FM reports "_____ outside door," and will continue to report the location of the device throughout the hoist.

6. When the device has been lowered to the survivor/ object and is held there for a short while, it will automatically attach to the device. Then the FM reports "Survivor in _____," "Ready to be hoisted"

7. Once the rescue is complete, with device and all survivor(s) aboard (You must remember to unhook the hoist device manually ("F5", "F6" or "F7")), FM reports, "_____ in Cabin."

8. You will be required to close the door before the FM reports "Going off HOT MIC", and begins secure check. The pilot maintains position until FM reports, "Boom stowed, ready for forward flight".

9. Finally when a steady rate of climb and 40 KIAS has been reached, the FM finishes with the secure check.

Hoist delivery

This procedure is used when something is hoisted from the helicopter to the ground or a vessel without the help of the Rescue Swimmer, and usually it requires the use of one of the three rescue devices described previously in the section called “Rescue Equipment”.

1. The pilot executes an approach to a hover above the survivor or object to be hoisted.

2. When the rescue check is complete (you must open the door to activate it), the FM reports “Rescue Check Complete, Ready aft for hoist deliver.”

3. The pilot voice directs “Go on HOT MIC,” “Check _____”. (The empty line indicates that the report will depend on what device must be lowered, and so it will in the following text. The devices are Basket, Sling or Litter).

4. The FM responds “On HOT MIC,” “Checking _____”. When this is done the FM reports “_____ Ready”.

5. You are now allowed to deploy the designated device to the rope (using either “F5”, “F6” or “F7”). When the device slides out, the FM reports “_____ booming out”.

6. Now in some hoists you will be required to manually deploy the object or person to be hoisted (“F4”). When this is done you can start lowering the hoist.

7. When the person/object has been lowered to the delivery site and is held there for a short while, it will automatically detach from the hoist. Then the FM reports “Passenger delivered”. (If there are more persons you must repeat the procedure until all have been delivered). When the last person has been delivered, the FM reports “All mission targets secured, Return to base”.

8. Once the delivery is complete, with device and all survivor(s) aboard (You must remember to unhook the hoist device manually (“F5”, “F6” or “F7”)), FM reports, “_____ in Cabin.”

9. You will be required to close the door before the FM reports “Going off HOT MIC”, and begins secure check. The pilot maintains position until FM reports, “Boom stowed, ready for forward flight”.

10. Finally when a steady rate of climb and 40 KIAS has been reached, the FM finishes with the secure check.

Free Fall or Sling Deployment

This procedure includes the Rescue Swimmer. Free fall or sling Deployment of the RS is only used over water.

1. The pilot executes an approach to a hover with the survivor(s) at the one - to - two o’clock position, outside the rotor wash.

2. When the rescue check is complete (you must open the door to activate it), the FM reports “Rescue Check Complete, Ready aft for free fall or sling deployment.”

3. The pilot voice directs “Go on HOT MIC,” “Check Swimmer”.

4. The FM responds “On HOT MIC,” “Checking Swimmer”. When this is done the FM reports “Swimmer Ready”.

5. You are now allowed to deploy the swimmer. This can be done in one of two ways. The decision of which to use will be entirely up to your judgement.
   A) FREE FALL DEPLOYMENT: With the aircraft in the desired position and altitude, the pilot commands "Deploy Swimmer." Maximum hover altitude for freefall is 15 feet RADALT. You must check the area below the helicopter for debris before you deploy the swimmer ("F3"). When the RS is released the FM reports "Swimmer away", then "Swimmer in the water".

   B) SLING DEPLOYMENT: Attach the swimmer to the rope ("F4"), when the aircraft is in the desired position over the target. You must the lower the hoist, and when the swimmer reaches the water he will report "Swimmer in the water". When the RS is clear of the sling, the FM reports "Swimmer away".

6. After safe water entry of the RS the FM reports "Swimmer OK". Now you must move the helicopter left and back to place the RS outside the rotor wash.

7. The RS will now act on his own swimming towards the nearest survivor in the water. When the RS has reached the survivor, the FM reports, "Move in for pickup". The RS will now head for the helicopter.

8. When the RS enters the rotor wash the FM reports "Deploy _____". (The empty line indicates that the report will depend on what device must be lowered, and so it will in the following text. The devices are Basket, Sling or Litter).

9. You must then hook the appropriate device on to the rope (using "F5", "F6" or "F7"), and then lower this down to water level where the RS is waiting with the survivor. The RS will then place the survivor in the device and when ready the FM reports "Ready to be hoisted".

10. If there are more victims in the water the RS will swim for them and you must repeat the above hoisting procedure again until all has been picked up. Finally you will need to hoist the rescue swimmer.

11. Once the rescue is complete, with swimmer and all survivor(s) aboard, FM reports, "Swimmer in Cabin." (You must remember to unhook the hoist device as well ("F6").

12. You will be required to close the door before the FM reports "Going off HOT MIC", and begins secure check. The pilot maintains position until FM reports, "Boom stowed, ready for forward flight".

13. Finally when a steady rate of climb and 40 KIAS has been reached, the FM finishes with the secure check.

Free Flight

Free flight is not really a rescue procedure and has no checks or points that need to be cleared. In free flight you are able to fly as you please with no time limit on your hands. Free flight missions are especially good for training flights and skill improvement (see the section called "Flying the Helicopters").
If you want to have an "official" mission completion to a free flight mission you will need to land the helicopter at the start site. The HSVD will point in that direction during the flight.

Survivor Condition

Your primary task in SAR3 will be to find the injured persons and pick them up. But your mission does not stop here. Some of the survivors you have picked up may have suffered an accident so severe that their life is slowly ebbing, and their only salvation will be proper hospital care. Therefore once the rescue situation at the accident site is over, you will be in a race against time to get the survivors to a hospital before their strength run out.

Injury Types

All survivors in SAR3 have been given a unique set of health condition characteristics. These will vary from simple concussion to gun shot wounds or heart attack.
The type of injury a survivor has will depend on the type of accident. Additionally it will be randomized a bit from mission to mission, which will make each time you play a mission a little different from the previous.

Effects of Injuries

A survivors injury type and condition has three important effects on the game:

1. The type of rescue device to be used when hoisting will depend on what type of injury the survivor's has suffered. (I.e. a man with a broken leg needs to be hoisted in the litter, where a man with broken arm can use the basket).

2. The type of injury will dictate the drop off site. (I.e. a man with a gunshot needs to go to the hospital, but a man who is mildly shaken can be dropped of on a parking lot).

3. The severity of the injury will dictate how much time you have left to deliver the survivor to the drop-off site. (I.e. a man with a gunshot wound will slowly bleed to death, but a man who is suffering from superficial cuts can stay alive a lot longer).

Checking Survivor Condition

Once you have picked up a survivor the Flight Mechanic will check his condition and give you a verbal report. He will continue to do so with regular intervals until the survivor has been delivered to a drop-off site. You can also make the check manually by pressing "F8".
If more then one survivor has been picked up, the FM will report the condition of the survivor suffering the most.

Condition Report

The Flight Mechanics condition report is given as an overall estimation of the survivor's current

health condition. (The exact injury type is shown in the "Console" 2D instrument). This estimation is based on how long the survivor has left before dying. Below is a list and description for each condition report:

Condition report	***Meaning of report***
No Victims	Means you have no survivors in the rear cabin.
Victim Is Dead	Means that a survivor has just died. FM is now checking the next.
Stabilized (or stable)	Survivor is in good health. (More then 500 seconds left to live)
Unstable	Survivor is weak. (Between 200-499 seconds left to live)
Critical	Survivor needs hospital care NOW! (Between 100-199 seconds left to live)
Victim Is Dying	Survivor will die within the minute! (Between 1-99 seconds left to live)
All Survivors Dead	All the survivors you picked up have died in the helicopter.

Errors During Flight

During a mission in SAR 3 you will have to follow certain rescue procedures as well as a set of basic helicopter flight safety rules. The procedures are explained previously in the section called “rescue procedures” and most of the flight rules are explained throughout the sections about the individual helicopters and the section called “Flying the Helicopters”.
This section shows a summary list of all error messages as they will be shown on the debriefing screen (under errors). A short description follows each error listed.

Device Deployed Before “Rescue Device Ready” Signal was Given

This error refers to the hoist procedures where you are using the sling, basket or litter. You will see this message if you have violated the rescue procedure rules by attaching any of these to the rope before the appropriate checks were made. (Violating this rule in real-life can result in hoist failures or un-secure attachment of the devices!)

Equipment Deployed Before “Equipment Ready” Signal was Given

This error refers to the hoist procedures where you are lowering equipment down from the helicopter. You will see this message if you have violated the rescue procedure rules by attaching the equipment to the rope before the appropriate checks were made.

Flying Over 135 KIAS with Gears Down

The maximum wheels-down safe speed is 135 KIAS. On the “Airspeed Indicator” instrument you will see this limit marked with a red line. You will see this message if you exceed this speed with the gears down, or lower the gears while flying above this limit.
(This error can of course not be reported if you fly the BK-117, as it has no wheels!)

Flying Over 40 KIAS with Cable Out

The maximum cable-out safe speed is 40 KIAS. You will see this message if you exceed this speed with cable out, or lower it while flying above this limit.

Flying Over 40 KIAS with Object Mounted on Hoist

The maximum safe speed with an object attached to the hoist wire is 40 KIAS. You will see this message if you exceed this speed with an object attached, or attach an object while flying above this limit.

Flying Over 60 KIAS with Hoist Door Open

The maximum safe speed with the rear cabin door open is 40 KIAS. It will be dangerous both for the rear cabin crew as they might fall out, but also concerning the general flight conditions. You will see this message if you exceed this speed with the door open, or open the door while flying above this limit.

Helicopter Damaged

You will see this message if you damage the helicopter in any other way then by a collision. (Except for total crash which is accounted for under “Helicopter damage” on the debriefing menu).

Helicopter Damaged because of Collision

Any kind of collision between the helicopter and ground or object is considered extremely dangerous. Even the slightest collision could result in damage.
You will see this message if you collide with anything. (Except for total crash which is accounted for under “Helicopter damage” on the debriefing menu).

Lifted Off before Ready Signal was Given

During takeoff it is important for the rotor to be at full rpm before commencing with lifting off. You will see this message if you lift off from the ground before the rotor is at full speed and you have been given the “Ready for take-off” message from the pilot voice.

Lifted Off while Stretcher was Deployed
During land and pickup missions where the stretcher is deployed it is important that you do not go flying around while the stretcher carriers run for the survivor. You will see this message if you lift off while the stretcher is in the field.

No Mistakes Made
This is of course not an error, but an indication of faultless flying!
(Except for total crash which is accounted for under “Helicopter damage” on the debriefing menu).

One or More Survivors Damaged by Downwash
The downwash from the helicopter puts a lot of air pressure on those directly under the helicopters rotor. This is especially dangerous for weakened or injured people trying to stay afloat in the water. You must therefore take care not to hover too close to lone survivors in the water. You will see this message if you hover close over a floating survivor for too long.

Pilot Dead, Campaign Terminated
You will see this message if you crash the helicopter and your campaign pilot dies.

Rescue Device Collision with Object During Hoist
You will see this message if a device attached to the rope collides with anything during a hoist.

Rescue Diver Died
This is a rare occasion and has to my knowledge never happened in real life. The rescue diver can be killed if he hits a boat or other object during a free fall drop to the water.

Stretcher Deployed before “Stretcher Ready” Signal was Given
This error refers to the rescue procedure called “Land and pickup” where you use the rescue stretcher. You will see this message if you have violated the rescue procedure rules by deploying the stretcher before the appropriate checks are made.

Swimmer Damaged by Downwash
Like survivors the rescue swimmer can also take damage from the heavy air pressure of the downwash. However he has been trained and is in fit shape to handle himself in the water. Therefore you will only see this message if you have really strained the strength of the swimmer and have been hovering extremely close to the water surface.

Swimmer Deployed before “Swimmer Ready” Signal was Given
This error refers to all rescue procedures where the rescue swimmer is used. It is very important that all security checks of straps, hoist and equipment are completed before the swimmer jumps from the helicopter. You will see this message if you have violated the rescue procedure rules by deploying the swimmer before the appropriate checks were made.

Swimmer deployed closer than 5 ft from survivor
To ensure both swimmer and survivor safety it is important (especially in freefall deployments) that you do not deploy the swimmer too close to the survivor. You will see this message if you have violated the rescue procedure rules by deploying the swimmer closer then 5 feet from the survivor.

Swimmer dropped from above 15 ft RADALT
To ensure swimmer safety in free fall deployment it is important that you do not deploy the swimmer higher than 15 feet from the water surface. The 15 feet level is marked in the “Radar Altimeter” instrument by a white line. You will see this message if you have violated the rescue procedure rules by deploying the swimmer from an altitude above 15 feet over water level.

Wrong rescue device lowered

To ensure fast and easy recovery of all survivors it is important that commands and directions between all crewmembers are understood and followed to the point. It is therefore important that you lower the correct rescue device as requested by the swimmer. You will see this message if you lower a wrong rescue device to the swimmer.

The Helicopters of SAR3

▶ The BK-117 C-1

Known for its outstanding multi-mission capabilities, the BK-117 C-1 can handle the most demanding missions, and it is one of the most versatile and functional medium twin-engine helicopters in the world.

The arrangement and layout of the medical outfit according to functional aspects is based on thousands of successful rescue missions and the close cooperation with rescue helicopter operators.

TECHNICAL SPECIFICATIONS (BK 117 C-1)

Weights:
Maximum Gross Weight..... 7385 lbs
Empty Weight..... 3869 lbs

Powerplants:
Two Turbomeca Arriel 1E2
Capacity ..... 1 Pilot + 7/10 passengers
Fuel Capacity..... 184 US Gallons
Rescue Hoist Capacity..... 800 lbs

Aircraft Dimensions:
Rotor Diameter 36.1ft
Overall Length..... 32.6ft
Height to top fin..... 12.63ft

Performance:
Max Speed..... 150 knots
Fast Cruise Speed..... 133 knots
Maximum Range 292 nm (nautical miles)
Max Endurance ..... 3 hours
Service Ceiling..... 10000ft

The RESCUE RULES AND HH-65A Dolphin

First flight of the Aerospatiale/Eurocopter Dauphin took place on June 2, 1972. Since then, several variants have been built with roles spanning over e.g. passenger/VIP transport, cargo lifting, naval defense and reconnaissance, close air support and last, but not least Search And Rescue missions.

The RESCUE RULES AND HH-65A Dolphin (as seen in SAR2) variant has search and rescue (SAR) as its

primary configuration. Its two pilots side by side can fly missions in almost any weather conditions. The crew compartment, up to three crewmembers can perform hoist operations, be deployed as rescue swimmers and take medical care of rescued victims.

TECHNICAL SPECIFICATIONS (HH65A Dolphin)

Weights:
Maximum Gross Weight.....9369 lbs
Empty Weight .....4940 lbs

Powerplants:
Lycoming LTS-101-750B-2 Gas Turbines
Capacity.....2 pilots + 11 Passengers
Fuel Capacity.....1900 lbs
Rescue hoist Capacity.....600 lbs

Aircraft Dimensions:
Rotor Diameter.....39.17ft
Overall Length.....38.15ft
Height to top fin .....13.32 ft

Performance:
Max Speed .....165 knots
Fast Cruise Speed.....150 knots
Max Range..... 400 nm (nautical miles)
Max Endurance.....3.5 hours
Service ceiling .....7520 ft.

The Sikorsky SH-3 Sea King

Born as the "Sea King" antisubmarine helicopter for the US Navy originally named HSS-2, the SH-3 is available in different models and is now used by several countries.
Sikorsky built more than 1100 of the original S-61s model, and the prototype lifted off first time in March 1959. Later Sea king was also built in Great Britain by Westland as "Sea King" and "Commando", in Italy by Agusta as AS.61 and in Japan by Mitsubishi.
The Canadian naval model is known under the name SH-3 Sea King.

TECHNICAL SPECIFICATIONS
(Sikorsky SH-3 Sea King)

Weights:
Maximum Gross weight ..... 21000 lbs
Empty Weight..... 11865 lbs

Powerplants:
Two 1400 shp General Electric T58-10
Capacity.....2 pilots + 10/15 passengers
Fuel Capacity ..... 3500 lbs
Rescue Hoist Capacity ..... 800 lbs

Aircraft Dimensions:
Rotor Diameter ..... 62 ft
Overall Length..... 55 ft
Height to top fin..... 17ft

Performance:
Max Speed..... 140 knots
Fast Cruise Speed..... 116 knots
Maximum Range 469 nm (nautical miles)
Max Endurance ..... 5.5 hours
Service Ceiling..... 14700 ft.

In the Cockpit

In this chapter, we will take a look at all the handles, buttons and dials in the cockpits, and explain how they work. You will not learn how to fly the Helicopters here, but you will learn about the instruments that are essential for flying them.

In our description of the instruments we will describe them in general terms that refer to all 3 helicopters in SAR3. However, the helicopters are different in several aspects, and we have made notes if it in our description where instruments or functionality of one helicopter differs from what we describe.

Flight Controls

A helicopter pilot uses all his limbs to make the helicopter behave as he intends it to. The right hand is holding a stick protruding from the floor in front of the pilot. It is called a Cyclic. The left hand is holding a grip called a Collective, and his feet rests on a set of pedals.

The cyclic can be moved along two axes: Moving it forward will make the nose of the helicopter go down, and moving it aft will make the nose pitch up. Moving the cyclic sideward controls bank: If the cyclic is pushed to the left, the helicopter will bank to the left, and vice versa. Usually, the joystick on your computer will control the cyclic, but you can also use the cursor keys or the mouse.

The collective can be moved in one direction only. When it is moved, the helicopter generally does not change attitude. If it is pulled upwards, you will climb, and if it is lowered, you will descend. If you have a joystick with throttle, you should assign this as collective. Otherwise, use mouse or keyboard.

The pedals control in which direction the nose is pointing: moving it from side to side. They are connected in such a way that if one is pushed down, the other one will go up. If you push the left pedal, the nose will turn towards left, and vice versa. Pedal game controllers are ideal for this purpose, but a twisting motion joystick, mouse or keyboard can also be used.

Landing Gear Controls

This section on landing gear is only relevant for the HH-65 and the SH.3 helicopters.

Toggling the “G” key (as assigned pr. default) will move the landing gear up and down. This corresponds to moving the gear handle to the bottom left of your instrument panel. When the gear is down, air resistance is increased, making it harder to pick up speed and making fuel economy look bad. For game rule purposes the highest allowed airspeed with gear down is 135 knots. For landings, you must of course remember to put the gear down again.

A helicopter that is equipped with wheels is able to drive on the ground. Many helicopters with wheels actually land on a runway, and then “taxi” to its designated parking space in the airport.
Once the helicopter has stopped it will be necessary to lock the wheels. Wheel brakes on the main gear can be toggled using the “B” key (as assigned pr. default).

Sometimes, even wheel brakes just aren’t enough to stay in the same place. When the weather gets rough, and the landing platform is the rolling slippery deck of a ship, another tool comes in handy.
This is the “TALON” decklock system, a hook that shoots down from the belly of the helicopter and grabs on to a grid of ropes on the deck. When the Talon is armed, it shoots down as soon as both main gear wheels are touching the deck. It then retracts, keeping the helicopter firmly on the moving deck. To toggle arming of the Talon, or to release it after use, press the designated key (default is “V”).

Engine Controls

If you look up and left, in the middle of the roof of the cabin, you will find three levers that control the two engines and the power transmitted to the rotors.
The yellow levers on the left and right sides are Fuel Flow Control Levers. Each can be placed in three positions: Cut-off, Idle and Flight. The rearmost position is Cut-off, where the engines will stop. The levers can be moved one step forward to the Idle position by pressing "E" and "T", respectively. Now, ignition will be on, and the engines will spool up to idle RPM. Moving the levers fully forward by pressing the same keys again will take them to the Flight position, where power will be transferred form the engines to the rotors, bringing the rotors up to flying speed.

Pressing the SHIFT key and "E" or "T" will move the levers backwards.

The red handle in the middle is the Rotor Brake Control Lever. When in the rear position, the brake on the main rotor is activated, and when the lever is forward, the rotor is free to move. The brake position is toggled using the "R" key (default setting).

The fuel flow controls and the rotor brake are interlocked: You have to release the brake before the fuel flow levers can be moved to the flight position, and you cannot activate the brake with the fuel flow levers in the flight position.

If you are carrying a heavy load, perhaps even at high altitude or in hot weather, you may have marginal or insufficient lift available. To get out of trouble, you can dump some of the fuel you are carrying. The key to toggle the dumping valve between open and closed is "F" (default setting). The dumping rate is 272 pounds/minute. As a safety guard, approximately the last 150 pounds cannot be dumped.

Instruments

Flying close to the ground means that your most important instrument is the view to the world outside. Still, a glance at the instruments is required from time to time, and sometimes the visibility may be so bad that the instrument panel is your only guide to safe flight.

Your suite of instruments include the following:

Flight Instruments
- Attitude Director Indicator
- Airspeed Indicator
- Radar Altimeter
- Barometric Altimeter
- Vertical Speed Indicator
- Horizontal Situation Video Display

Engine Instruments
- Triple Tachometer
- Triple Torquemeter

Misc. Instruments
- Landing Gear Position Indicator
- Landing Gear Warning Light
- Master WARNING Light
- Console

Let's go through the list instrument by instrument. (Note: All 3 helicopters in SAR contain similar instruments, and the descriptions in this section are valid for all 3 helicopter instrument panels. The images of the instruments shown in this manual are all from the HH-65)

Attitude Director Indicator

In low visibility conditions, this instrument is a substitute for your view of the outside. The ADI shows the orientation of the helicopter relative to the horizon. The stationary yellow wing in the middle represents the helicopter, and the moving blue/brown ball the world. In reality, the ball is kept stationary by gyroscopes, and it is your cockpit that is revolving around it. If the wing is in the blue, your nose is up, and if the wing covers the brown region, you are nose down. If you are banking, the ball will bank also: If the ball tilts to the left, you are banking to the right and vice versa. This may sound confusing, but you will see that it works quite well. When you are less than 200 feet above ground level, a radar altitude pointer will become visible. This is a green and white horizontal bar that will rise towards the yellow wing, as you get lower, and touch it when you are at ground level.

Airspeed Indicator

This dial displays your speed through the air in the forward direction. A small tube is protruding in the forward direction, and as airspeed builds up, the pressure changes inside the tube, and this pressure is translated into the displayed airspeed. As this type of measurement works poorly at very low speeds, nothing will be shown below 15 knots. If there is any wind, this will make your airspeed different from your ground speed.
The unit is knots, i.e. nautical miles per hour. The dial is split into some colored regions:
Green band, ...0 - 150 kts.....Max weight operating range
Yellow band, ...150 - 165 kts.....Operating range
Red line,.....135 kts.....Max gear out and power off speed
Red line, ...165 kts.....Never-exceed speed.

Radar Altimeter

You have two instruments that inform you of your current flying height – it is very important to know in which way they perform differently. Your Radar Altimeter measures your height above the ground by emitting a radar pulse downwards and timing its return. Other structures large enough to reflect the radar signal, like rooftops, ships, etc., will also affect the radar altitude. The instrument is to the upper right on the panel. This type of altimeter is only used when flying close to the ground, as is evident because the scale ends at 2000 feet above ground level (AGL). The scale is finely graduated and very responsive when close to the ground, and gets less detailed as you go higher.

Barometric Altimeter

As you get further away from the ground, the Barometric Altimeter is more practical to use. This measures air pressure, which decreases as you go higher, and translates it into an altitude. When you enter the cockpit, the altimeter will be adjusted to show your height above sea level, independent of whatever air pressure the weather conditions dictate. Note that this altimeter does not show your height above any obstacle, so be careful when using it close to the ground.
The barometric altimeter is located in the right side of the instrument panel, below the radar altimeter.
In the centre of the display, your altitude in feet is shown as digits. The leftmost number drum shows hundreds of feet. To the right this is followed by two counters showing thousands and ten thousands of feet, respectively. At low altitude, the leading zeroes will not be shown.

In addition, a needle shows your altitude. Each number on the needle clock is one hundred feet, so that one complete turn of the needle corresponds to a 1000 ft altitude change.

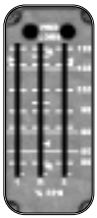
Vertical Speed Indicator

Below the altimeters, you will find a related instrument, the Vertical Speed Indicator. This displays how fast you are climbing or descending by measuring the rate of change in the air pressure. The scale is in thousands of feet per minute, showing up to 3000 FPM in both directions. The graduation is finer for vertical speeds less than 1000 FPM, which makes this instrument much easier to use e.g. to maintain level flight rather than watching the altimeter slowly move.

Horizontal Situation Video Display

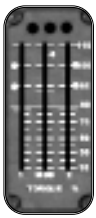
When it comes to navigation, the Horizontal Situation Video Display (HSVD) is the instrument to use. It is a computer screen that shows information provided by the navigation computer. In the centre of it, there is a small aircraft symbol that represents your helicopter. The symbol is stationary, with the nose pointing in your forward direction and so forth. In a circle around it, a compass rose is shown. This rotates so that your current heading always can be read under the downward pointing arrow at the 12 o'clock position. Your mission is planned as a set of waypoints before take-off. An arrow pointing outwards from the inside of the rosette shows the direction to the currently selected waypoint. The distance to the waypoint is shown under the DIST label in the upper right corner. The unit is nautical miles. Your speed is shown in two ways: Inside the rosette, under IAS, your indicated airspeed is written. This is exactly the same as shown by the airspeed indicator instrument. In the upper right corner, the ground speed is shown under GSPD. This is your forward speed over the ground, which will usually be different from the IAS because of wind.

Triple Tachometer



This instrument consists of three colour-coded bars displaying the revolutions per minute (RPM) of your two engines and the main rotor.
The main rotor RPM is shown by the bar in the middle. The Dolphin is equipped with a throttle governor that automatically tries to keep the rotor RPM at 100%, or 350 RPM. The allowed range for continuous flight is from 97% to 108%. During normal flight, the main rotor will be very close to 100% RPM, but it can become low if you pull the collective enough so that there is not sufficient power to keep the rotor speed up. RPM will of course also go down if you lose engine power. Conversely, RPM can become higher than 100% if you lower the collective and enter auto-rotation. Be warned that a too high RPM may cause the rotor to break up. You should get used to listening to the rotor beat rather than looking at this bar.
The turbo-shaft engines have two sets of independently rotating blades. The first set is the compressor, or gas generator stage, which are the ones that you hear spool up when starting the engines. The second set of blades converts the gas pressure to power for the rotors through a gearbox. The RPM of this power turbine is what is displayed for each engine in the left and right sides of the triple tachometer. Because of the gear system, the power turbine RPM will closely follow the main rotor RPM, whenever the engines are providing thrust. On the other hand, the main rotor is allowed to overtake the power turbines, so that if no power is required, the main rotor RPM will be higher than the power RPM. These are also the bars to inspect if you think an engine failure has occurred. In case a power turbine RPM falls below 84%, the red warning light over the relevant bar will illuminate.

Triple Torque Meter



(This instrument can only be found on the 3D panel inside the cockpit)
This instrument is closely related to the tachometer in layout, but instead it displays the twisting forces, also called torque, inside the gearbox. The bar in the centre shows the torque transferred to the axis of the main rotor. This is the sum of the torque from the two engines, shown on each side of the centre bar. The amount of torque will change as the throttle governor controls the engines to keep the main rotor at 100% RPM.
The bars are colour coded: Green indicates the continuous flight range, from 10% to 88% torque. The yellow range extends from 88% to 100%. This range is allowed for hover and transition, e.g. accelerating and climbing to the desired cruise setting. Above 100%, the three bars become red to indicate a too high load that will eventually wear down the gearbox. In addition the engine over torque lights will illuminate above 100%, and above 103%, the main gearbox over torque light will turn on.

Landing Gear Position Indicator

(This instrument cannot be found in the BK-117, as this helicopter does not have retractable landing gear)
Immediately to the right of the landing gear control handle, the Landing Gear Position Indicator shows the status of the gear. When the gear is down and locked in place, a green arrow will illuminate for each leg. As the gear uses some time for moving up and down, an amber caution light above the three arrows will illuminate whenever the gear is moving.

Landing Gear Warning Light

(This instrument cannot be found in the BK-117, as this helicopter does not have retractable landing gear).
To remind you of putting the gear down before landing, a Landing Gear Warning Light will illuminate whenever you are within 200 feet of the ground and the gear is not down. The warning light is located at the top of the panel, right in front of you.

Master WARNING Light

When a critical malfunction has been detected, the Master WARNING Light will turn on, and an audible warning horn will start also. Acknowledge that you are aware of the warning by pressing CTRL C. The horn and light will turn off until another critical situation occurs. Of course you will now have to examine the cause of the warning and take proper action.

Console

The floor panel between the pilots has screens for entering navigation data etc. In this simulation these screens are instead used for displaying information to keep you up-to-date on the mission progress and important events. Pressing the TAB key toggles displaying the console on/off.

On-Screen Help

The on-screen help box can be activated using the “O” key (default setting). It is placed in the upper left corner of the screen. We have implemented this feature to help beginning players to get through a mission. When the box is activated its content will constantly be updated with advice, guidelines and hints on what to do to complete the mission.

The Flight Computer

Flying a helicopter is a lot of work. Flying a helicopter on a SAR mission in awful weather is really a lot of work, sometimes so much work that even the best pilot cannot perform well enough to save the lives of the people in distress. So to help the pilot to concentrate more on solving the mission and worry less on steering the helicopter, the Automatic Flight Control System (AFCS) was introduced.

The Automatic Flight Control System

The idea of the AFCS is to keep you, the pilot, in command of the helicopter, while the AFCS helps making steering simpler. Instead of a direct link between your controls and the rotor blades, the flight computer collects the input from you, figures out what you want the helicopter to do, and then moves the rotor blades to make the helicopter do just that.
It sounds nice and easy, and it is so. To experience how flight is without the help from the AFCS, toggle activation by pressing the "M" key (default key setting). You will find that with complete manual control, the helicopter is really taxing to steer.

The AFCS controls rotation about the vertical axis, also called yaw axis, in the following way: Below 40 knots, you will be in "heading hold" mode, that is, your nose will not turn in the sideward direction unless you apply pedals. Depressing a pedal will change the desired heading by a maximum rate of 30 degrees per second.
At speeds above 40 knots, you are in "auto co-ordination" mode. This means that the nose will be turned to point into the flow of air. In this way, you are pointing in the direction you are going and the helicopter body will produce less drag. If you push a pedal, the nose will turn slightly, but as soon as you release the pedal again, the nose will turn into the relative wind again.

If you are accelerating through 40 knots with the nose not pointing in the direction of motion, you will consequently experience a little sideward kick as the AFCS changes mode.

The AFCS treats the pitch and roll movement in almost identical ways, so we will examine these at the same time. Pitch is the angle the nose makes to the horizon, and roll is the angle the helicopter banks to the left or right. The pitch and roll angles together define an attitude, i.e. the helicopter orientation relative to the horizon. The AFCS remembers a "reference attitude" that it will try to put the helicopter into, if no other cyclic stick inputs are given. Initially the reference attitude will be horizontal, but you can set it by tilting the helicopter into an attitude and then pressing and releasing the "Sync/Trim Release" button, which is the "0" key on the keypad. At the moment of releasing the key, you will have defined a new reference attitude. You cannot define a very extreme reference attitude, though. The pitch angle has to be no more than 12 degrees nose up or down, and the bank angle can be 45 degrees at maximum.
You are not allowed to place the helicopter into more dramatic attitudes of 60 degrees pitch up or down and 60 degrees roll to either side. The AFCS will refuse to let you exceed these angles. When the deflection of the cyclic is decreased, the helicopter will return rapidly to an attitude with the allowed reference attitude range, and from then on it will adapt to the reference attitude at a slower pace.

So what is all this good for? Setting a reference attitude is a way of trimming the helicopter to a certain state of flight. Every pitch angle corresponds to a specific airspeed, and every bank angle to a rate of turn. When you have established a desired speed and turn, a quick tap on the Sync/Trim Release button will make the helicopter stay in that state while you can relax. When the nose wheel touches the ground, the tendency to return to the reference attitude is disabled so that the helicopter can settle properly on the surface.

The Autopilot

Flying at constant altitude and airspeed while navigating through your waypoints or searching for the source of a distress call is not the hardest thing in the world, but still requires an amount of attention.

The autopilot can help you to make life a lot easier in such situations. Engage the autopilot by pressing the "F11" key (default key setting), and push another time to disengage it. When the autopilot is active, it will take over control of the pitch and collective, and in return keep your airspeed and barometric altitude constant, at the values at the moment of engaging the autopilot. You will maintain full control over bank and yaw, which means that you can still turn to change course. This takes a lot of work out of navigation.

Beware that the autopilot keeps barometric altitude constant. This means that it will not hesitate to fly right onto a mountain or another obstacle if there are any at that altitude. So stay alert and be ready to disengage at every moment!

Using the Flight Director Slew Switch, a four way button located on the pilot's cyclic stick, can change the reference speed that the autopilot tries to maintain. Holding down the "Home" key will increase the reference speed at a rate of 4 knots per second, and pushing "End" will decrease the speed at the same rate. The highest allowed reference speed is 150 knots. In this way, you have very good control over airspeed, even though you cannot directly control pitch.

It is not quite true that you give up control over pitch. If you push or pull the stick hard enough, a "fly through" feature will allow your input to override the autopilot input. Still for complete pitch control, you will have to disengage the autopilot.

Hover Augmentation

Search And Rescue missions often require extremely precise hovering under difficult conditions. The Hover Augmentation flight computer mode is an invaluable tool here. Activation of this mode can be toggled using the "F12" key.

Using the ground tracking radar, ground speed is determined in both forward and sideward directions, and the flight computer steers the helicopter to get zero ground speed in both directions. If you are more than 50 feet above the ground, the helicopter will descend to 50 ft AGL and stabilize there. If you are already below 50 ft AGL, the current height will be maintained. In HA mode, the flight computer takes control of both cyclic and collective, leaving only the pedals to you. But also here "fly through" is available and very useful. If the cyclic stick is deflected more than about 1/3 of its full travel, your command will override the flight computer's command, and the helicopter will move in a horizontal direction, still maintaining the height over ground. As soon as the cyclic is released, the flight computer will reduce ground speed to zero again. This can be utilized for very precise hovering.

The zero ground speed mentioned above is actually a reference ground speed that initially is set to zero. You may change the reference ground speed using the Flight Director Slew Switch, implemented as four keys. Pressing a key will increase the reference ground speed in the same direction by four knots per second. The following keys represent a direction:

Home:.....Forward
End:.....Backwards
Delete:.....Left
PgDn:.....Right

You should be cautious flying over uneven terrain using this feature, as the height over ground varies rapidly, forcing the flight computer to try to make similarly rapid height changes.

A little trick: When you have used the slew switch to set a certain ground speed and want to quickly go back to zero ground speed, rapidly disengage and then re-engage hover augmentation. This will set the reference ground speed to zero. The same trick can also be used for levelling the reference attitude.

The hovering height can be altered using the three-position Hover Beep switch. In reality

located on the collective grip, its Up position in this simulation is the “7” key on the keypad, and its Down position the “1” key on the keypad. For every time it is flicked up or down from its centre position, the reference hover height will go 3 feet up or down, respectively.

Basic Helicopter Aerodynamics

▶ At first look, it is really mind-boggling that such a strange machine as a helicopter is able to fly, and even does it well. In this section, we will look at some of the basic principles that make a helicopter work.

How a Wing Works

A helicopter has no wings - and then again, it has. A fixed wing aircraft flies by moving the wings through the air at high speed. A helicopter has to work even at a standstill in the air; so fixed wings will do no good. Instead, the wings of the helicopter are put on a rotating axis and in that way they are able to move through the air at high speed also when the helicopter is not moving.

So how does a wing really work? You have probably heard it before; the wing is slightly curved on the upper side, and this creates a suction force that can be used as lift. Well, that is correct, but it is not a very useful explanation. Instead, we should start by looking at rockets. A rocket accelerates because it pushes some mass (propellant) in the opposite direction to which the rocket is going. This is a very fundamental principle, called Newton’s Third Law: “To every action, there is an equal and opposite reaction”. The wing works in the same way: It is pushed upwards because it is pushing air downwards. The way it is pushing is where the curved upper surface enters the picture.

The Rotor System

The helicopter has to push a lot of air downwards to fly, and that is what the large horizontal main rotor is for. As the rotor pushes, it transfers energy to the air. The rotor needs to be re-supplied with energy constantly, and this is what the engines turning the shaft of the main rotor do. The turning force, or torque, will make the helicopter body rapidly turn in the opposite direction of the rotor, which is of course very impractical. To prevent this, the vertical tail rotor pushes on the tail cancelling the turning force of the engines.

Controlling the Helicopter

The helicopter is primarily piloted by manipulating three controls: The collective grip, the cyclic stick and the anti-torque pedals.

Changing the pitch angle of all rotor blades at the same time controls the lifting force of the main rotor. This is why the control handle for doing this is called the collective. For more lift, the forward edges of the rotor blades are pointed more upwards. In the cockpit, the collective grip is raised to do this. If less lift is desired, the blade pitch is made less steep by lowering the collective towards the floor.

As mentioned above, you do not get lift for free. As the rotor produces more lift, more engine power is automatically added to maintain working RPM. This in turn increases the force making the body rotate about the vertical axis. The way to counter this is to make the tail rotor push harder on the body also. Just as the collective controls the main rotor pitch, the pedals control the tail rotor pitch. Of course the tail rotor can be used for more than countering torque - it can also be used for rotating the body about the vertical axis.

For accelerating in the forward or sideward direction, the main rotor has to be tilted so that its lifting force is pointing in the desired direction. This is a bit tricky, as every rotor blade is constantly moving around. This problem is usually solved by a “swash-plate”. This is a ring around the main rotor axis that can be tilted according to movements of the cyclic stick. If the cyclic stick is moved forwards or backwards, the swash-plate is tilted in one direction, and

if the stick is moved sideward, the plate is tilted in the other direction. The swash-plate is actually two rings that move in the same plane. The lower one is stationary, except for the tilting motions, and the upper one is rotating and connected by rods to the pitch controls of each of the main rotor blades. This means that if the swash plate is tilted, the pitch of the main rotor will increase on one side and decrease on the other side, in spite of this the whole assembly is spinning very fast at the same time. The pitch change will in turn create a tilting force on the rotor, and in this way it is possible to control the orientation of the main rotor and the direction of its lift.
In the following text, you will sometimes encounter the term “vector”. This is just another way of saying direction. Imagine e.g. a lift vector being an arrow pointing in the direction of the lift force, and the length of the vector is proportional to the strength of the lift.

With this knowledge, you are ready to learn to fly the Dolphin. As we progress through the training program, more details of helicopter aerodynamics will be added.

Flying the Helicopters

▶ By reading this section, setting up and flying the practice situations described, you should be able to acquire enough skill as a helicopter sim. pilot to take up this simulation’s challenge of a career as a search and rescue pilot.
If you have flown other helicopter simulators, you might be able to do fairly well if you skip this training course and start out on the missions right away. But chances are that you will be missing something vital covered here.
In the training lessons it is assumed that you have selected the “Realistic” physics. If you do not want to bother with all this training, you might want to jump in and fly about in the “Easy” or “Arcade” physics modes. But if you really want to experience the details of the simulation, you should use the “Realistic” mode only.

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Training Flight Set-up

You will define the training flight yourself, using the menu system. First make sure that your controls are set up properly in the “Options” menu. In the main menu, select “Single Mission”. You will then be prompted for a mission type/ name. The free flight missions are ideal for this purpose, as mission goal and time limit will not distract you. You will have several options available in the next menu screen. Select “Realistic” at the “Physics” entry. For the first missions, you should select the sun symbol for both “Weather” and “Time of day”. Turn the “Time limit” off.
When you start the mission, you will be looking at the helicopter from behind using the tail camera. You can use this view or the trace camera for the training, but the most realistic experience of course requires you to use the cockpit camera. If you use the outside views, turn on the 2D instrument panel. Inside the cockpit, you may find the 2D panel the easiest to use, but you can also use the 3D-cockpit panel.

Forward Flight

▶ Let us first look at flight manoeuvres with plenty of forward speed.
At a speed of 40 knots or more, you will find that the Dolphin is particularly easy to control, and in many ways behave like a fixed wing aircraft. Below 40 knots, auto-coordination will be disabled and the handling changes considerably, so stay out of that regime for now.
For all forward flight exercises, set up a flight session as described above, and in addition select the flying helicopter symbol at the "Start position" entry.

Straight and Level

When you enter the simulation, you should be pretty much set up for straight-line flight. Now we just need to keep it that way. In this exercise, you will only need to use the collective and the pitch control of the cyclic. Look at the vertical velocity indicator, and adjust the collective until the needle settles at zero. Do not concentrate only the needle, but get a feel for the delay in between moving the collective and a new vertical speed is established. When you are satisfied, move on to controlling your airspeed at the same time. If the airspeed indicator shows you are slowing down, lower the nose a little and vice versa.

Changing Speed

When you are able to fly level at a fixed speed, try to change airspeed while maintaining altitude. Decide a new, higher airspeed, and accelerate towards it by putting the nose down. Note how you lose altitude at the moment the nose goes down. Your main rotor lift is about the same as before, but it is now pointing more forward and less up, so you are consequently dropping. The proper way to accelerate is therefore to add a little collective as you put the nose down.
The next step is to decelerate to a lower speed while staying at the same altitude. Tilting the lift vector backwards by raising the nose does this. Perhaps surprisingly, you now have to decrease collective a bit to stay level. The explanation for this is that the rotor and body is now transforming some of your forward energy to extra lift. If you pitch up strongly, you will hear the main rotor pick up speed. Be careful not to over speed the rotor, as it might break apart.

Turns

A turn is made by banking, which will point the lift vector towards the inside of the turn. As you do this, you will decrease the upward pointing component of your lift vector, so you will have to add more collective. As you start practicing level turns, note your altitude and your heading on the horizontal situation display before entering the turn, and decide the heading at which you will exit the turn.

If you are used to flying fixed wing aircraft, you will be tempted to pull back on the cyclic to get the lift required to turn. Don't! This will just make you slow down. Instead, keep the nose low enough to maintain airspeed.

It is a good idea to adopt a favorite angle of bank and always use that when turning. This will give you a good idea of your turning radius and the time to complete a turn, which will be much harder if you use a different bank angle each time. Your bank angle could be a modest 30 degrees, where the rotor is only required to produce 15% more lift than in level flight. Or you could opt for 45 degrees, where 41% more lift is required. This means the helicopter will feel 41% heavier, also described as pulling 1.41 G's. A higher bank angle will be impractical. 60 degrees of bank will require you to pull 2 G's, which is not possible if the helicopter is heavily loaded with fuel and cargo - see the section on stalls below - and you will also be fighting the bank limiter of the AFCS.
As a rule of thumb, you should start rolling out of the turn when the remaining heading change is half of your bank angle. So, let's practice turns: Start flying straight and level, and make a mental note of your altitude and airspeed. Slowly increase bank to 30 or 45 degrees while watching the vertical velocity indicator. Increase collective to keep the VVI needle at zero. Keep turning while maintaining airspeed and altitude. Then level out while decreasing the collective to establish

straight and level flight.
When you are getting the hang of it, decide on a new desired heading before entering the turn, and exit the turn at precisely that heading.

Climb and Descent

Climbing while flying straight ahead is quite simple: Adjust the collective until the desired rate of climb is achieved. The engines have to work harder, so watch the over torque warning lights. Around an airspeed of 70 knots, you will be able to climb at a rate of about 2000 feet per minute with full tanks, while at both lower and higher speeds, performance will be less.
Descent is also a simple process. You just lower the collective to produce less lift. Use a shallow descent whenever possible, you will then avoid two dangers: A steep descent may result in rotor over speed, and the nose is blocking sight of where you are going.
When you are comfortable with climbing and descending while flying on course, you can try combining these with a gentle turn.

Using Reference Attitude

Moving the cyclic stick in the helicopter, you will feel a force that will try to push it back into a neutral position, very similar to the centering force of a computer joystick. Flying at a certain attitude, especially at high speeds, will require you to constantly push the stick. This can be quite tiresome and will adversely affect the precision of your input.
When you have established a desired attitude, you should press and release the Sync/Trim Release button. The AFCS reference attitude will then change to your current attitude, and you can relax the forces on the cyclic.

Using the Autopilot

Even more comfort is available using the autopilot. When you have established an adequate cruise altitude and airspeed for travelling to the next waypoint, you will probably want to activate the autopilot. Try to perform level turns in this mode. Easy, isn't it? Also try to adjust your cruise airspeed using the Flight Director Slew up and down buttons. Be nice to the autopilot, and it will be nice to you. It controls altitude quite aggressively, so if you engage the autopilot while in a climb or dive, it will try to stop the vertical motion abruptly, which may be an unpleasant experience. So try to be flying straight and level at the moment of engaging.

Asymmetric Lift and Retreating Blade Stalls

The rotating wings of the helicopter makes it able to do things no fixed wing aircraft could attempt, but there are also some problems associated with using rotors for getting lift. While hovering, all blades move through the air at the same speed, but as the helicopter starts moving forward, the situation gets more complex: The main rotor of the helicopters rotate clock-wise seen from above.

We will call the blades on the left side of the advancing blades and those on the right side of the retreating blades. At high-speed forward flight the advancing blades will have a tremendous airspeed, as the total airspeed is the sum of the helicopter speed and the rotating speed. On the other side, the retreating blade will move much slower as the two speeds are in the opposite direction here. As the rotation speed increases with radius, the tip of the retreating blade will still move through the air at a fair speed, while the innermost section with very little rotational speed will move backwards through the air.
As difference in speed means difference in lift, the angle of attack (AoA) of the advancing blade is decreased and the AoA of the retreating blade is increased to compensate for this. If no compensation were made, the helicopter would start rolling to the right as soon as it moved forward. At some point, increasing AoA of the retreating wing does not help anymore. It fails to produce more lift and stalls instead. In such a retreating blade stall, lift is lost on the right side of the helicopter, and you will start to roll to the right and loose altitude.
To recover from a retreating blade stall situation you will have to lower the forces on the rotor,

i.e. require less lift from it. Do so by lowering the collective and centering the cyclic. Resist any temptation to try to roll in the opposite direction using the cyclic. It will only make things worse! Better yet than recovering is to avoid the stall at all. This means that you should be very cautious when manoeuvring at high speeds. And note that the conditions: heavily loaded helicopter, high altitude, warm weather and low air pressure are all making the stall appear earlier.
The retreating blade stall begins at the root of the blade and moves outwards if the load increases further. You will still be able to fly with the inner section stalled and the outer part producing adequate lift. In this case, the inner section will produce turbulence and vibrations, warning you of a fully developed stall if you increase the rotor load.

Hovering

▶ The ability to fly at low speed and even hover is what makes the helicopter the best or only choice for performing certain missions. Handling the helicopter at low speed is a very different task from forward flight, and generally involves a lot of manipulation of all controls, including the pedals, which are rarely used at high airspeeds.
During the hover, you rely mainly on visual references, and your instruments are of little use. To start with good visual feedback, select a mission that takes place over ground e.g. the "Car Crash" rescue. Even if you prefer the cockpit views, you should initially try some of the external views, as these are better for examining the hover.
To get started right away, select the hovering helicopter symbol at the "Start position" entry. Note that hovering start is not available for the free flight missions. When you jump into the mission, you will be in "hover augmentation mode", which means that the flight computer keeps your ground speed and vertical speed at zero. When you are ready, disengage hover augmentation by pressing the "F12" key (default key assignment).

Ground Effect

First, let us get proper control over your height. There is a fair chance that you start out with a collective position that is far away from the required position for hovering, so you may be initially climbing or descending rapidly. Adjust the collective until you achieve zero vertical speed.

Then try to change the collective position a little, and observe a peculiar effect: When you are quite close to the ground, about a rotor diameter or less, you seem to settle at a certain height depending on the collective position. This is called the "ground effect". The downward flow of air from the main rotor is being increasingly deflected by the ground as you get closer, and this increases rotor effectiveness. In effect, it requires less power to hover the closer you are to the ground. This is also why two maximum hover altitudes are listed in the technical specifications: A quite high "In Ground Effect" altitude, and a lower "Out of Ground Effect" altitude.
Some tricky situations may occur: If you are hovering over sloping ground, the down flow can escape easier, and ground effect will be reduced. When taking-off from the roof of a tall building, you should be careful when passing over the edge away from the building, as the ground effect will suddenly disappear.
The air cushion below the helicopter will only exist when your airspeed is low. As soon as you start to move, the ground effect will be reduced. This also goes for hovering in wind: You may have zero ground speed, but if your airspeed is considerable, the ground effect will weaken.

Manoeuvres During Hover

When you have established a steady hover altitude, you should practice moving around. Keep the ground speed low to stay in the ground effect, and be prepared to support with a little collective if you start sinking.
Your forward and backward speed is controlled with cyclic movements in the same directions. When moving backward, you should of course be absolutely certain that there are no obstacles behind you.

Sideward motion is similarly controlled with side ward movements of the cyclic. Notice that even at a completely level attitude, you drift a little to the left. This is an undesired effect of the tail rotor: When it pushes the tail to cancel torque, it also pushes the entire helicopter a little. So a completely stationary hover actually means that you have to bank slightly to the right. The AFCS keeps your heading steady while in a hover, but you can rotate about your vertical axis using the pedals.
When you have practiced all these motions one by one, it is time to do them all at once. A most rewarding exercise is to find an isolated object like a tree, and hover in a perfect circle around it, while always pointing the nose at the tree.

Hovering Climb and Descent

Large altitude changes while hovering should generally be avoided. You will of course have to make height adjustments in the hover, but that should be all. Climbing with near zero airspeed is very inefficient. It is much better to accelerate to about 70 knots and climb at that speed. Descending in a hover should be avoided because you cannot really see where you are going. Also, you can enter a dangerous situation called "Settle with Power", which is described below.If you make a sufficiently fast vertical descent, you will move along with the air that your main rotor has just thrown downwards. This air is very eddy and turbulent, so it will be a rough ride. The air will be re-ingested by the main rotor and thrown downwards once again. This is practically useless: The air will form a vortex around your main rotor, and you will drop like a rock. If this happens near the ground, you are obviously in trouble. You can get out in two ways: Pull the collective all the way up to use all the available engine power to get out. Maybe you have the power, maybe not. The other way is to lower the collective to fall even faster and enter auto-rotation (see below). Both methods can be combined with putting the cyclic forward to get some horizontal speed. In general, avoid near-vertical powered descent at a higher rate than 500 feet per minute.

Hover Augmentation

By now, you have found out that hovering is hard work. It can be a lot easier if you use the Hover Augmentation mode of the flight computer. As described in the instrument section, it will zero your ground speed and maintain a fixed radar altitude. Using cyclic fly-through, you can position yourself very precisely horizontally, and set your height using the Hover Beep switch. Via the Flight Director Slew button, you can also fly at a fixed ground speed.
In this simulation, you will have to perform other crew duties than just the pilot's. When acting as hoist operator, you will find the hover augmentation mode invaluable.

Transitioning From and To Hover

You have already tried modest forward speeds while hovering. To enter the forward flight regime, accelerate by holding the nose low. For safety reasons, the best way to accelerate from a low altitude hover is to stay level until an airspeed of at least 50 knots has been reached. Some cyclic movement will be required to maintain altitude during the acceleration: As you pitch down in the hover, you will loose upward lift, and weakening of the ground effect will cause a further loss of lift. So at low speed, you will have to increase collective. As speed increases above about 20 knots, you will gain lift, and you can lower the collective a little again. This is called "translational lift" and happens because the lift is now created by moving through a large amount of air that is pushed down a little instead of pushing a lot on a small amount of air, as is the case in the hover. The latter case happens to be the least effective.
When you want to decelerate from forward flight to hover, it should again be done at low altitude to avoid a steep hovering descent afterwards. At high speed, you will have plenty of lift due to the translational lift state and because you are converting forward speed to lift. So here the collective will be low and you should take care not to over-speed the rotor. As speed becomes lower, you will lose lift and you will have to increase collective. Eventually, you will enter the hover and take advantage of the ground effect.

Take–off and Landing

▶ By now, you should be able to fly the Dolphin pretty well, and all we need is to figure out how to get off the ground and back again. To start on the ground with the engines shut down, select the helicopter on ground symbol at the "Start position" entry.

Starting Engines

It is recommended that you perform the start-up procedure while using the cockpit view. The following is a start-up checklist adopted for the simulation. You might be able to cut a corner or two if it seems too tedious.

(Note: the following procedure is only applicable for "Arcade" and "Realistic" flight modes. "Easy" flight mode has a simple one button start procedure)

BEFORE STARTING ENGINES

- Wheel brakes - SET. .....("B")
- TALON - OFF.....("V")
- Check full free movement of all cyclic, collective and pedals.
- Collective - NEUTRAL.

If you are using an analogue collective control, set it to zero lift, which is about one-third up from its lowest position.

- AFCS - AS DESIRED. .....("M")
- Auto pilot - OFF. .....("F11")
- Hover Augmentation - OFF. .....("F12")
- Hoist - IN, no cargo attached. .....("W")
- Cabin door - CLOSED. .....("F2")
- Both fuel flow levers - OFF .....(SHIFT "E" and SHIFT "T")
- Rotor brake - ON. .....("R")

Ok, actually the casual pilot could cut away most of the stuff above, but now for the important steps:

STARTING ENGINES

- Engine 1 - START. .....("E")

You can check the fuel flow control lever's (FFCL) position visually by panning the view to the centre of the roof. It takes 15 - 20 seconds to reach full gas turbine RPM.

- Engine 2 - START. .....("T")
- Rotor brake - OFF .....("R")
- FFCL - BOTH FORWARD.....("E" and "T")
- Low RPM lights off - CHECK

Your rotors should now be at 100% RPM, and your co-pilot will verbally confirm that you are ready for take-off.

Taxiing

In case your helicopter is not parked on the helipad, you can taxi to the take-off location. Release the wheel brakes then push the cyclic forward and hold it there. Slowly add collective and you should start rolling forwards. If you are going backwards, the collective is too low and the main rotor is pushing the helicopter back. Set the collective to neutral when you have adequate speed, and steer using the pedals. Hit the wheel brakes again to come to a stop. If there is a strong wind, it is recommended to face into the wind before take-off.

Take-off

Increase collective until you are airborne. Establish a hover. If your nose is not already pointing into the wind, now is a good time to make it so. Put the nose down to accelerate to 50 knots or more, then start a climbing turn towards your first waypoint. Take the gear up, if desired — the gear must be up if you are to fly faster than 135 knots IAS.

Landing and Shut-down

As you close in on the landing site, notice the wind direction from observing windbags, or review your weather briefing. Carefully scan the surroundings for obstacles and then plan your approach. Whenever possible, you should fly past the landing site in the downwind direction at about 500 ft AGL, turn around, and make the final approach upwind. On the downwind leg, perform the before landing check:

BEFORE LANDING CHECK

** Wheels - DOWN .....("G")* *Not applicable for the BK-117*
* Wheel brakes - AS DESIRED .....("B") *Not applicable for the BK-117*
* TALON - AS DESIRED .....("V")
* Wheels - CHECK
* Autopilot - OFF.....("F11")
* Hover Augmentation - OFF .....("F12")

The Talon deck arresting system should only be engaged when landing on ships. This will assist in getting a firm touchdown on a rolling and heaving deck. Several single missions will allow you to practice using the Talon.

As you fly the final leg, make a shallow descent while transitioning to a hover a few feet over the landing pad. Make sure not to enter the settle with power condition during this phase. Then lower the collective to touch down.

When you have landed, you may taxi to a parking spot, (Not applicable for the Bk-117), or shut down immediately:

SECURE CHECK

* Parking brake - SET .....("B")
* FFCL's - IDLE DETENT.....(SHIFT "E" and SHIFT "T")
* Both fuel flow levers — OFF .....(SHIFT "E" and SHIFT "T")
* Rotor brake - ON. .....("R")

Then enter the head quarters for the de-briefing, a visit to the men's room, a cup of coffee or a nap, while the ground crew prepares the Dolphin for the next flight.

Emergencies

▶ The Dolphin is a sturdy machine, but still there is always a remote chance of a malfunction. By far the most likely cause of a malfunction is improper handling by the pilot.

Autorotation

Probably the most common reason for people to be reluctant to enter a helicopter is "what happens if the engines quit?" They don't realize that a helicopter is usually much safer than a fixed wing airplane in such a situation.
If a power loss occurs, due to engine or gearbox failure, the main rotor will loose RPM and you will drop out of the sky if you don't act quick. The solution is to enter autorotation. If you let air flow up through the main rotor, it will behave just like a windmill. You will have to lower the collective immediately as a power loss is detected. If you wait too long the rotor will slow down, and will be very hard to get up in RPM again. The best RPM for autorotation is about 110% — be

careful not to go much higher, as you may destroy the main rotor. Moving through fresh air is the best for autorotations as well as powered flight. The best airspeed is 70 knots, where you will be descending at a rate of about 2000 feet per minute. At higher or lower airspeeds, the rate of descent will be even higher.
So what is the point? The rate of descent is clearly too high for a safe landing! In the rapidly spinning main rotor you have stored a colossal amount of energy. When you pull the collective, this energy can for a brief moment slow your descent enough to touch down gently.
As soon as autorotation has been established, select wheels down and look for a spot to land. If there is room enough, the easiest way to land is to keep the forward speed of about 70 knots and land like a fixed wing airplane. If you have the time, turn to face the wind direction. You can also choose to enter a hover immediately above the ground and land from there. This requires extremely good management of the energy stored in the rotor, and will require a lot of practice. To stay safe, keep a combination of airspeed and altitude that will allow you to make an autorotating landing if you suddenly loose power. This means that you should avoid hovering or flying slowly at altitudes between 50 feet and 500 feet AGL, and not fly above 100 knots very close to the ground.
You can practice autorotations by retracting both fuel flow levers to the idle position. This will remove all engine power, but you can quickly regain power by advancing the levers again.

Flame-out

An engine may stop because it does not get any fuel or because it has ingested smoke that stops the combustion. In case of a flame out, the torque and RPM bars for that engine will rapidly drop to zero. If both engines flame out, you will have to enter autorotation, but you should be able to continue flying on a single engine if you refrain from manoeuvres using a lot of power. In that case, dump as much fuel as you can afford.
You can attempt to restart the engine in the following way:

RESTARTING ENGINE IN-FLIGHT

- Identify failed engine
- FFCL - OFF .....(SHIFT “E” or SHIFT “T” twice, depending on engine)
- FFCL - IDLE.....(“E” or “T”)
- FFCL - FLIGHT.....(“E” or “T”, if engine ignites)

It is recommended that you practice single engine flight so you get a feel for the manoeuvres that are possible in this state. Practice by retarding one of the fuel flow levers to the idle position.

Gearbox Failure

If too much torque is used, the gearbox will eventually break. You may loose transmission of power from one or both engines, or loose power to either rotor.
In a single engine gearbox failure, the engine RPM will stay nominal while the torque drops to zero.
You may proceed with single engine flight as described above.
If transmission to the main rotor is lost, enter autorotation immediately and land.
If power to the tail rotor is lost, or it is damaged by a collision, the consequence depends on your flying state. In a hover or low speed flight, the nose will yaw strongly to the left, and the helicopter will rotate rapidly about its vertical axis in the counter-clockwise direction. Immediately enter autorotation and land. During forward flight, the vertical tail fins will provide a stabilizing force, and a moderate yaw to the left will be experienced, along with loss of pedal response. If possible, maintain a forward speed of at least 70 knots and perform a power-on rolling landing. Otherwise, enter auto-rotation and land.

Gear Damage

(Not applicable for the BK-117)
A too hard touchdown may damage one or more of the wheel struts. In this case, determine whether it is safer to land on the remaining gear, or perform a gear-up belly landing.

Rotor Collision

Main or tail rotor contact with any object should absolutely be avoided. Immediate destruction of the rotor will result.

Navigation

▶ Visual Meteorological Conditions

As you enter the helicopter, a list of waypoints specific for your mission has already been uploaded to the navigation computer. After take-off, you can simply turn to make the arrow to the first waypoint point straight ahead, and fly in that direction. It can be vital to execute the SAR mission as quickly as possible, so you should cruise at 120 to 150 knots. As you get within about two nautical miles of the waypoint, start visually searching for the target and slow down if you are required to enter a hover. The selected waypoint will automatically be incremented when the mission at the current waypoint is completed. If the mission circumstances somehow change, you may manually select the next waypoint by pressing the "F10" key. Note that in the console, you will be asked to confirm a manual change of waypoint by pressing "Y" or "N".

Instrument Meteorological Conditions

When the weather is changing from bad to worse, the requests for SAR assistance starts coming in. You will be going to work when the sky is dark and the visibility is about zero. To accomplish a successful mission in such conditions, you will have to be able to fly well while only using instruments.

For training these situations, set up a single mission to take place during night and in fog. Select to display the 2D instruments, and turn off the console so that the attitude indicator (ADI) is shown.

You now have to practice an efficient instrument scan: Start looking at the attitude indicator, which is by far the most important instrument when you cannot see anything outside. Then scan the instruments systematically going from right to left and return to the attitude indicator. Do not dwell at any instrument, analyzing what it displays, but just look at each for about half a second. When you return to the ADI, react to the picture of the situation you got, with much smaller corrections than you would use under visual conditions. Then perform the next instrument scan, and so on. It is a good idea to climb to an altitude where you do not have to worry about collision avoidance during the cruise. Make extensive use of the autopilot and hover augmentation to reduce the workload. During landings and most of the SAR operations, you will have to acquire the goal visually.

Correcting for Wind

On a nasty flight, you may encounter wind speeds of 60 knots or even higher. This is a lot for helicopters with top speeds of between 120 to 160 knots and typical cruise speed of about 110-140 knots. Your ground speed will be strongly affected by head- or tailwind, and flying on course will be more difficult.

If you steer directly after the waypoint arrow on the horizontal situation display, you will drift off course and waste time and fuel. As an example, let us assume cruise airspeed of 140 knots and a side wind of 60 knots. To stay on course, you will have to steer 23 degrees into the wind. Generally, you will not calculate a heading correction for wind, but will judge your actual direction of motion over the ground by looking at the terrain, and adjust your heading until the direction of your motion coincides with the direction of the navigation pointer.

Flying in Arcade or Easy Mode

▶ Arcade

The behavior of the helicopter in arcade mode is of course very simple. Any motion is dampened, as if you were moving through thin syrup. The collective commands a barometric altitude autopilot so that you can change your desired altitude by moving the collective. Pitch and roll motions bounce back to level after a cyclic input has been made. Keeping up forward speed will require constant forward cyclic stick, unless you use the trim function: Hitting the keypad "0" key will trim the controls to your current joystick deflection. To set trim to level again, hit "F12". Hover augmentation and the autopilot are disabled in arcade mode.

Easy

The "Easy" mode was created for people who do not care about how a real helicopter reacts, but who just want to thrill and excitement of speeding to spectacular rescues. The basic philosophy behind this mode is that pressing "Forward" means moving forwards and pressing "left" means moving left (and so forth). As a player you will not have to be careful of how much power you give. Just hold the direction key down and watch the helicopter move smoothly. (In some way you could say the helicopters act more like fixed wing planes in this mode!).
Another simplified function in this mode is the engine start- and shutdown-procedures. In "Easy" mode the only key used is "R" (default key setting).

Flying Without AFCS

So, perhaps you are a really hot pilot who does not need any flight computer to hold your hand? Well, we will see about that!
First of all, any sane pilot will use the AFCS as much as possible in order to perform optimally during the SAR 3 mission. Still, the flight computer is just another piece of equipment that can malfunction; so flying without AFCS should be practiced.

Controlling the Helicopter Without AFCS

Control of the helicopter is extremely demanding without the AFCS. You should have joystick or similar control of cyclic, collective and rudder. Keyboard control will simply not do.
It is recommended that you start experimenting with AFCS off when on the ground or in a hover. As explained below, the helicopter will be quite well behaved in pitch and roll response, while yaw motion will be very pronounced. Now you manually have to compensate for the torque on the main rotor shaft, so you will have to practice using the pedals in coordination with cyclic movements.
When you feel confident about hovering, you can try forward flight. Here yaw control becomes easier as the tail fin stabilizes the helicopter in yaw. In stead, cyclic control becomes tricky. Mostly because the advancing and the retreating blades produce different amounts of lift, the neutral cyclic position moves quite a lot as you pick up speed. A simple trim function is available: When you press "0" on the keypad, the current cyclic position will immediately be used as the new centered cyclic position. You should trim before a large change is required, otherwise a nasty jump will result from the immediate change in trim. This is also the reason that you should be cautious when disabling AFCS in forward flight, as a large trim change will be required. As the speed gets higher, control will become more and more difficult, and speeds higher than about 100 knots are likely to result in loss of control. As the flight computer is no longer restricting extreme attitudes, you can attempt do perform aerobatic maneuvers like loops and rolls, but be prepared that this will be extremely difficult.

The No-AFCS Flight Model

This section is just for the technically interested - there is not much here that will help you in flying the helicopter.

You might ask whether it is really the same helicopter simulation you are flying when turning the AFCS off, as it feels so different. The answer is yes, or alt least very close to yes... The AFCS is very successful in taming the flight characteristics of the helicopter so that it changes from a wild beast to a mild servant. Still, there is a change in the flight model: Gyroscopic forces were not fully implemented when the flight computer code was written, so when the AFCS is used, gyroscopic forces are disabled.

The nice thing about the rapidly spinning main rotor is that it will try to keep its orientation just like a spinning top or a gyroscope. It stabilizes the helicopter around the pitch and roll axis. Have you noticed that the axis of a slightly tilted spinning top changes direction, describing a circle? This phenomenon is called gyroscopic precession, and affects all spinning objects, including main rotors. It appears as a force acting on the rotating object makes the object behave as if the force was applied 90 degrees later in the rotation if the body was not moving. E.g., the main rotor spins clockwise seen from above, and a force is pushing the rotor tip at the right side of the helicopter down. This will not make the right move down, but in stead make the tail go down and the nose goes up. As the right side is the location of the retreating blade, which produces less lift than the opposite side, you will feel a tendency for the nose to rise as you pick up speed. Gyroscopic precession has also to be taken into account when designing the controls. The example above shows that when the cyclic is pulled back, the angle of attack of the rotor blade to the right side should decrease while it increases on the left side, and the angle remains unchanged front and aft.

The large amount of trimming required with AFCS disabled is more pronounced than in a real helicopter. This is because main rotors are flexible, either because of built-in hinges or a flexible material is used. This makes the blades “flap” as they rotate, neutralizing much of the trim forces. To make the calculations manageable, the rotor in this simulation is completely rigid. With the AFCS activated, the flight computer takes care of the extra trimming required. But with AFCS disabled, you have to take care of the extra work.

Trouble Shooting

▶ If you are having problems with SAR, this section might be able to help you. Please read through the following paragraphs before contacting your dealer or InterActive Vision A/S.

Basic faults

First of all you should make sure that the screen and speaker power is on. Check that you have inserted the correct CD and that it is not bent or scratched.

Make sure that you computer meet the requirements mentioned in the section called “System requirements”, and that it is in fact Windows 95, 98 or 2000 with an installed Direct X version 5 or higher that you have.

Sound Problems

Sound Effects

SAR 3 uses DirectSound(tm) for Windows(tm) to handle the sound. This means that any problem you may have with the sound in SAR 3 should also be present elsewhere in your Windows(tm) 9x system. Before you go on, you should make sure that your system is actually capable of transmitting sound. You can do this by finding the control board called “Sounds”, opening a WAVE sound file and playing it.

If you are unable to make your Windows(tm) play any kind of sound, you must consult the

Windows(tm) manual or the manual for your sound card to find out how to make it do so.
If Windows™ is able to play the wave file; the sound in SAR ought not cause any trouble. If it does, nevertheless, it may be due to a fault in your DirectX installation. (You can install DirectX 7 from the Search And Rescue 3 start-up box).

Music

The music in SAR 3 is transmitted from the CD and is of high CD quality. If you cannot hear the music, it may well be because the CD-ROM drive is not connected to the sound card. A cable connection between these two is necessary as the sound card cannot otherwise mix the sound and transmit it through the loudspeakers. Usually a cable goes with the sound card or with the CD-ROM, and all you have to do is to install it according to the respective manual. If you do not want to open your computer, you can simply insert the plug of the loudspeaker or headphone jacks into the CD-ROM sound output and listen to the music that way.
Another reason could be that the volume is turned down completely. This is easily adjusted by double-clicking on the loudspeaker next to the clock on the Windows taskbar, or inside SAR 3 in the options menu.
As mentioned in the "Missing Sound Effects" section, problems with the sound are most often due to general problems, and not to a defect in SAR 3. Make sure that other program for Windows are capable of transmitting sound and music, by for instance inserting a music CD and turning on the Windows CD-player, before you blame SAR 3.

Optimizing For Speed

We spent a lot of time and effort, making SAR2 runs as fast and smooth as possible, even on smaller machines. If you want the game to run faster anyhow, this section contains a few useful hints.

1. First of all you should try changing the detail level settings in the setup menu. Move all sliders towards the left hand side of the screen (towards 0 %).

2. Pick a lower screen resolution in the Search And Rescue 3 start-up box.

3. Make sure you have the latest drivers for your graphics card installed. Contact you graphics card manufacturer for more information (You will most likely be able to download the drivers for free from the Internet).

4. Close all programs before starting SAR3. Programs running in the background might take processor power or RAM away from SAR3.

Frequently asked questions

This section lists a number of questions that is often asked by new SAR2 players. You might find some of our answers of help!

Question:

For some reason, the helicopter keeps going madly out of control.
This isn't something that I am doing to cause this, normally I am flying along level, at cruising speed (140 knots) when the power seems to just suddenly shut down, and the helicopter goes into a mad spin. There is no way of pulling out of this, once the warning light comes on, I can try to land, and have nearly done so, I managed to slow the helicopter right down, to nearly hovering, got the landing gear down, and was about to try a landing, when the helicopter started to spin out of control and caused me to crash.

Answer:
From your description, it appears that you have selected the realistic physics with crashes on. It seems that you are experiencing gear box failures from overstressing the aircraft. Watch closely the three over-torque lights in the 3D cockpit, and adjust the collective so that they are not illuminated.
Overstressing for an extended period of time can result in one or more of three types of damage:
1. Single engine power loss: The aircraft can still be flown gently on the remaining engine.
2. Main rotor power loss: The aircraft must be landed immediately using autorotation.
3. Tail rotor power loss: The aircraft will behave almost normally at high speed because of the wind over the vertical tail fin, but if slowed down, yaw control will be lost and you will spin counter-clockwise. The aircraft must be landed using auto-rotation, preferably with a forward speed of 60kts.

At the first sign of power loss, you must immediately lower the collective and, if at forward speed, raise the nose to keep the main rotor RPM up by entering autorotation. Failure to do this soon enough will at forward speed induce retreating blade stall, and you will roll to the right, and it will be very difficult to regain control. Waiting too long before lowering the collective will cause such a low RPM that the rotor will be too deeply stalled to regain RPM.

Glossary

This small glossary contains explanations for terms and abbreviations, which are not explained in any other part of the manual.

Hot MIC
This defines a communication period where casual talk is prohibited. The “Hot MIC” is activated during hoists or other rescue procedures, and while it is on all crew must use special voice commands and responses.

KIAS	Short for “Knots Indicated AirSpeed”.
AFCS	Short for “Automatic Flight Control System”.
HOV AUG	Short for “Hover Augmentation”.
IAS	Short for “Indicated AirSpeed”.
RPM	Short for “Revolutions Per Minute”.

Credits

Developer

InterActive Vision A/S

Lead Game Designer	Allan A. Kirkeby
Lead Programmer	Mikkel Stensgaard
Assistant Programmer	Rune Vendler
Physics Programmer	Anton Norup Sørensen
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Helicopter Modelers	Mariusz Kadewski, Radoslaw Kurczewski
Object Modeler	Wojciech Duras
Landscape Artists	Marcin Zdrojewski, Grzegorz Gogolin, Jaroslaw Gluszczynski, Krzysztof Adamin, Marek Maslowski
Front-end Artists	Thorsten Ørts, Mikkel Fredborg, Thomas Suurland
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Sound Effects	Allan A. Kirkeby (Special thanks to 'Soundkids')
Assistant Designers	Mariusz Kadewski, Mikkel Steensgaard
Lead Q&A Tester	Janusz Gasecki
Tester	David Eric Guna, Joshua Maynard, Jerome Thomasz Borowiec
Management	Sven Højstrup Christensen
Thanks to	Marcin Zdrojewski, Martin T¯rring, Christian Lillbäck and Kirsten Frausing

Publisher

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Art Director	Derrick Wilson
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... and a special thanks to TalonSoft for all their help.

SEARCH AND RESCUE HELICOPTER FLIGHT SIM

Search & Rescue 3

The U.S. Coast Guard has once again put out the call for brave individuals to step forward and risk their very lives in the line of duty. In this latest installment of the critically acclaimed SAR series, you begin your career as an ensign and it is your job to command any of 3 authentic rescue choppers through over 100 new missions in an attempt to save lives.

Whether you're repairing a volatile oil rig, or plucking victims from frigid ocean swells, every mission will immerse you into authentic rescue situations, and will require a steady hand, nerves of steel and sometimes even a little luck.

Features:

- ✔ ***3 Different Helicopters:*** *the BK-117 C-1, the HH-65A Dolphin, and the Sikorsky SH-3 Sea King, each with their own realistic flight modes, responding to torque and hover effects, weight, auto-rotations, aircraft emergencies and speed limitations.*
- ✔ ***3 Flight Modes:*** *Easy, Arcade and Realistic, so everyone, regardless of skill can get right into the action.*
- ✔ ***3D Modeled Victims and Rescue Workers*** *that react to player action with advanced artificial intelligence.*
- ✔ ***Realistic Weather and Environmental Effects*** *such as rain, fog, wind gusts and even night missions.*
- ✔ ***Layered Sound Effects*** *including engine and rotor sounds, chopper functions, and environmental cues.*
- ✔ ***Realistic Audio Speech Communication*** *— dozens of new detailed commands.*
- ✔ ***10 new graphically improved Realistic Flight Areas*** *including coastal regions, inland plains, mountains and cityscapes.*

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